

User Manual

Acoustic Leak Detection System **Sebalog N-3**



Mess- und Ortungstechnik Measuring and Locating Technologies

Elektrizitätsnetze
Power Networks



Kommunikationsnetze
Communication Networks



Rohrleitungsnetze
Water Networks



Abwassernetze
Sewer Systems



Leitungsortung
Line Locating



Consultation with SebaKMT

The present system manual has been designed as an operating guide and for reference. It is meant to answer your questions and solve your problems in as fast and easy a way as possible. Please start with referring to this manual should any trouble occur.

In doing so, make use of the table of contents and read the relevant paragraph with great attention. Furthermore, check all terminals and connections of the instruments involved.

Should any question remain unanswered, please contact:

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1 Safety advices

1.1 General notes

Safety precautions This manual contains basic advice for the installation and operation of the system. It is essential to make this manual accessible to the authorised and skilled operator. He needs to read this manual closely. The manufacturer is not liable for damage to material or humans due to non-observance of the instructions and safety advices provided by this manual.

Locally applying regulations have to be observed.

Symbols used in this manual Important instructions concerning the protection of staff and equipment as well as technical safety within this document are labelled with one of the following symbols:

Symbol	Description
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or material damage.
	Notes have important information and useful tips on the operation of your equipment. Non-observance may result in useless measurement results.

Working with equipment of SebaKMT All electrical regulations of the country where the system is operated have to be observed as well as national regulations for prevention of accidents and existing regulations for the safety and operation of equipment of the involved companies.

Original accessories ensure safe operation of the equipment. It is not allowed and the warranty is lost if other accessories than the original ones are used with the equipment.

Checking the scope of delivery Check the contents of the package for completeness and visible damage right after receipt. In the case of visible damage, the device must under no circumstances be taken into operation.

If something is missing or damaged, please contact your local sales representative.

Repair and maintenance Repairs and service must only be done by SebaKMT or authorised service departments of SebaKMT. SebaKMT recommends having the equipment serviced and checked once per year at a SebaKMT service location.

SebaKMT also offers direct on-site support. Please contact our service office for more information.

Special transportation requirements The transport of lithium batteries themselves and of devices which contain such batteries is subject to regulations based on the UN Model Regulations 'Transport of Dangerous Goods' (ST/SG/AC.10-1).

Please inform yourself about the transportation requirements and follow them when shipping the system.

EMV This measuring system is intended to be used in the industrial field. When used in residential environment, there may be disturbing effects on other devices - e.g. radio or television.

The conducted emissions comply with the Class B limits (residential environment) and the radiated emissions comply with the Class A limits (industrial environment) according to EN 55011. As the device is supposed to be used in industrial environment at a safe distance to residential environment, it may not interfere with devices located in living areas.

FCC This device/system complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device/system may not cause harmful interference, and (2) this device/system must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

1.2 General cautions and warnings



- The limits described under Technical Data may not be exceeded.
- Do not drop the components of the system or subject them to strong impacts or mechanical shocks.
- Do not operate the devices of the system with a voltage unequal to the specified operating voltage. Differing voltages may cause malfunction and damages.
- All the components of the system must be in a technically perfect condition for measurement.
- The indicated degree of protection can only be ensured if plugs or the provided protection caps are put in all sockets of the device.
- The plugs of the supplied connection cables are only compliant to the indicated degree of protection as long as they are plugged in. Plugs which are not connected or which are connected in a wrong way are not protected from water and dust ingress.
- If the O-ring seal of a socket is obviously damaged, it must be replaced in order to ensure the total protection against water and dust ingress compliant with the indicated degree of protection.

2 Technical description

2.1 Functioning and features

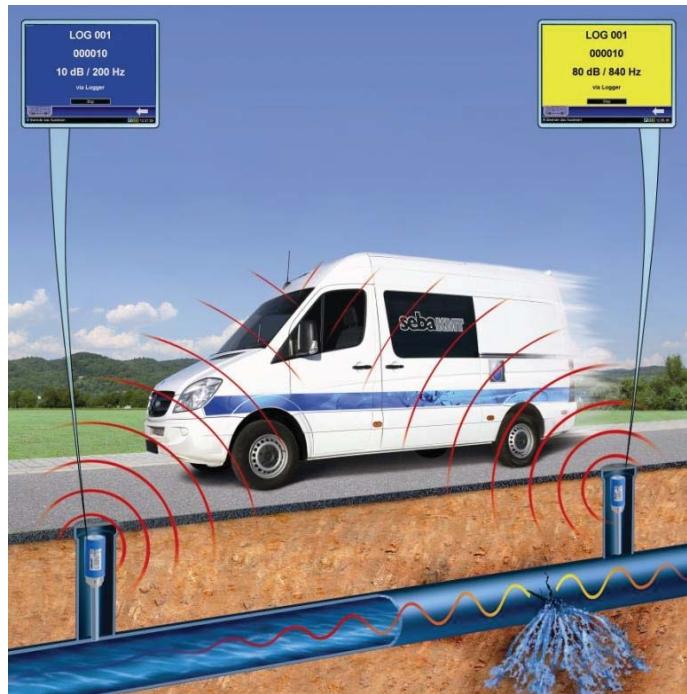
Sebalog N-3 is a system for acoustically monitoring pipe systems. It has Log N-3 noise level loggers and the portable programming and reading device Commander-3 as its basis.

To monitor a zone, you can attach as many noise level loggers along the pipe as you wish. They then perform regular noise measurements within a certain time window. The user can set the exact measurement time window and other parameters before measuring begins. The level and frequency of the individual measurements are saved in the logger. Even the quietest noise is saved as an audio recording.

'Lift&Shift' After measuring, you can collect the loggers, call up the readings and check for leak noises, and then put them back in a new zone, for example. This allows all the zones in a pipe system to be checked in succession for leaks.

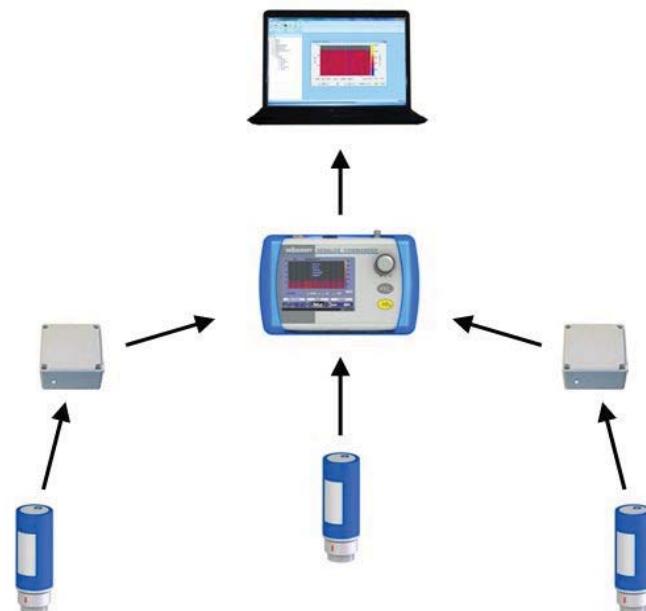


'Patrolling' However, the loggers can also be left in the same zone to monitor it permanently. The measurements from the individual loggers are then read out on site. Just approaching the installed loggers with the Commander or another reader will suffice. Wireless data transfer takes place automatically. Ideally, all you have to do is drive by where the loggers are being used ('Patrol' mode).



,Network' If a network is established, the measured data are automatically transferred from the loggers to a control centre ('Network' mode).

The evaluation of the measured data is possible using the Commander-3 or the SebaDataView-3 software on the computer.



Features The Sebalog N-3 system has the following features:

- Loggers can be used temporarily, permanently or in the network
- Wireless communication between all components
- Audio data recorded directly in the logger
- User-friendly application software 'Seba DataView-3'
- 'Commander-3' with colour display, USB port, large memory capacity, and much more
- Complete group/logger management without a PC possible
- 'History' function
- Extended wireless range using repeater

Components The Sebalog N-3 system consists of the following components:

Component	Use
Log N-3	Noise loggers measure regularly the volume level and frequency of the noise in the pipe during the programmed measuring window.
Commander-3	Portable control unit for programming the loggers before measuring, and for reading out and analysing the recorded data after measuring.
Seba DataView-3	User software for programming the loggers before measuring, and for reading out and analysing the recorded data with a PC or laptop.
Repeater-3	Radio range extender to forward the radio signals from the loggers and therefore extend the wireless link between the loggers and Commander.
GSM box-3	Network node used as the interface between the logger network and control centre during wireless remote data transmission.
Reader-3	Reading device for reading out the measurements taken by the Sebalog series of loggers.
Log RI	Radio interface (optional) used as the wireless interface to the loggers or repeaters when connected to a PC/laptop.

2.2 Technical data

Logger The noise level loggers are specified by the following technical parameters:

Parameter	Value
Wireless interface (bidirectional)	<ul style="list-style-type: none"> Range Transmitting power Frequency Approx. 80 m (depends on the surroundings) 10 mW 868 MHz (EU) 913.02 MHz (US) 915 MHz (others)
Memory capacity	Max. 100 measuring days
Audio recording	Possible
Power supply	Lithium battery
Battery life	Max. 5 years (depending on use)
Operating temperature	-20 to 60°C (-4°F to 140°F)
Storage temperature	-25 to 70°C (-13°F to 158°F)
Dimensions (W x H)	115 x 45 mm
Weight	400 g
Degree of protection	IP68

Commander-3 The Commander-3 control unit is specified by the following technical parameters:

Parameter	Value
Display	6" VGA colour display, 640 x 480 pixels
Wireless interface (bidirectional)	<ul style="list-style-type: none"> Range Transmitting power Frequency Approx. 100 m (depends on the surroundings) 10 mW 868 MHz (EU) 913.02 MHz (US) 915 MHz (others)
USB port	USB 2.0 for connecting to a PC
Memory capacity	2 GB (corresponding to approx. 1,000 groups, each with 1,000 loggers, including audio data, etc.)
Power supply	<ul style="list-style-type: none"> internal external Li-ion rechargeable battery (7.4 V / 12.25 Ah); connection to 110-240 V supply using charger (input: 50-60 Hz, 700 mA)
Operating time	Approx. 20 hours
Operating temperature	-20 to 60°C (-4°F to 140°F)
Storage temperature	-25 to 70°C (-13°F to 158°F)
Dimensions (L x W x H)	250 x 190 x 100 mm
Weight	2.100 g

Degree of protection	IP65
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Reader-3 The Reader-3 reading device in the Sebalog N-3 system is specified by the following technical parameters:

Parameter	Value
Display	LCD display (b/w), 128 x 32 pixels
Wireless interface (bidirectional)	<ul style="list-style-type: none"> • Range Approx. 100 m (depends on the surroundings) • Transmitting power 10 mW • Frequency 868 MHz (EU) 913.02 MHz (US) 915 MHz (others)
USB port	USB 2.0 for connecting to a PC via docking station
Memory capacity	1 GB (SD memory card)
Power supply	Li-ion rechargeable battery (7.2 V / 12 Ah)
Operating time	10 hours
Operating temperature	-20 to 60°C (-4°F to 140°F)
Storage temperature	-25 to 70°C (-13°F to 158°F)
Dimensions (L x W x H)	200 x 100 x 60 mm
Weight	450 g
Degree of protection	IP22

Repeater-3 The repeaters in the Sebalog N-3 system are specified by the following technical parameters:

Parameter	Value
Display	Status LED
Wireless interface (bidirectional)	<ul style="list-style-type: none"> • Range Approx. 400 m (depends on the surroundings) • Transmitting power 10 mW • Frequency 868 MHz (EU) 913.02 MHz (US) 915 MHz (others)
Power supply	Lithium battery (replaceable)
Battery life	Max. 5 years (depending on use)
Operating temperature	-20 to 70°C (-4°F to 158°F)
Storage temperature	-25 to 70°C (-13°F to 158°F)
Dimensions (L x W x H)	80 x 80 x 55 mm
Weight	250 g
Degree of protection	IP67

GSM box-3 The GSM box in the Sebalog N-3 system is specified by the following technical parameters:

Parameter	Value
Wireless interface (bidirectional)	<ul style="list-style-type: none"> Range Transmitting power Frequency Approx. 400 m (depends on the surroundings) 10 mW 868 MHz (EU) 913.02 MHz (US) 915 MHz (others)
Memory capacity	2 GB (corresponds to the data from approx. 50 loggers)
Power supply	<ul style="list-style-type: none"> internal external Lithium battery (replaceable) 12 V, 4 A
Battery life	Up to 4 years
Operating temperature	-20 to 70°C (-4°F to 158°F)
Storage temperature	-25 to 70°C (-13°F to 158°F)
Dimensions (L x W x H)	170 x 140 x 100 mm
Weight	1.000 g
Degree of protection	IP67

Log RI The Log RI wireless interface in the Sebalog N-3 system is specified by the following technical parameters:

Parameter	Value
Display	Status LED
Wireless interface (bidirectional)	<ul style="list-style-type: none"> Range Transmitting power Frequency Max. 10 m (depends on the surroundings) 1 mW 868 MHz (EU) 913.02 MHz (US) 915 MHz (others)
USB port	USB 2.0 for connecting to a PC
Power supply	Via USB
Operating temperature	0 to 40°C (32°F to 104°F)
Storage temperature	0 to 40°C (32°F to 104°F)
Dimensions (L x W x H)	83 x 17 x 47 mm
Weight	50 g
Degree of protection	IP22

2.3 Scope of delivery and accessories

2.3.1 Set contents

Commander set A LOG SET CDR-3 consists of the following components:

Designation	Description	Item No.:
LOG CDR-3	Commander-3	820024391
CSW DATAVIEW-3	<i>SebaDataView-3</i> user software	118302210
LOG CDR-3-T	Carrier bag for Commander-3	820025752
LG SEBALOG	Charger for Commander-3	810919
LK 14	Vehicle charger cable (3.5 m long)	81003758
VK 77	Connection cable (USB output)	820012451
KR 22-5	Stereo headphone	810002087
	Antenna 868 MHz with magnet (MAG3-900 TNC)	122010060

Logger set A logger set consists of the following components:

Designation	Description	Item No.:
LOG N-3	Noise level logger (number depending on set size)	820019682
LOG MWA	Magnetic angle adaptor (number depending on set size)	118303355
	Thread cap M6 (number depending on set size)	118304578
	Transport box	118303892

2.3.2 Optional accessories

The following optional accessories are available:

Designation	Description	Item No.:
LOG GPS-3	GPS module for Commander-3	118303791

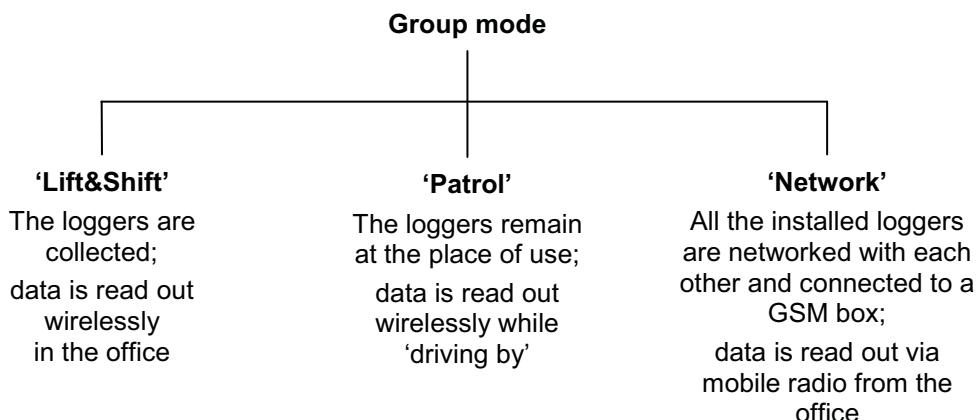
3 Important and common terms

User mode The Commander-3 can be operated in two different user modes:

- Easy mode
- Professional mode

You can switch between these modes in system settings menu (see page 33).

Group mode In order to analyse the recorded measurements, the noise loggers must be read after measuring, i.e. the data in the loggers is accessed wirelessly with a reading device (Commander/Reader/PC). It is possible to do this in the following ways:



The method must be chosen for reading out the measured data before the measuring work is performed. Before measuring, the mode decided on is permanently assigned to the loggers or logger groups. After that, only loggers that have been configured for reading using 'Patrol' can be read with 'Patrol', for example, and not with 'Lift&Shift' or 'Network'. The same applies to the other group modes.

The name of every 'Lift&Shift' group automatically begins with a 'L'

The name of every 'Patrol' group automatically begins with a 'P'.

The name of every 'Network' group automatically begins with a 'N'.

Level and frequency These two values are identified each time a noise logger performs a measurement:

'Level' ... is the noise level (volume) of a measurement

'Frequency' ... is the frequency in the measurement's frequency spectrum with the greatest deflection

ESA value ESA stands for 'Extended Spectral Analysis' and means that noise level and frequency are combined in one reading using a mathematical formula. This results in an extended view of the measured data, which makes the leak probability and position visible in relation to other loggers. The dimensionless ESA value can be between 0 and 100. The higher the ESA value, the higher the leak probability and the shorter the distance from the logger to the leak.

<i>Workgroup</i>	The Commander can only ever interact with a single registered logger group. This group is called the 'workgroup'. It is not possible to program or read loggers from another group.
<i>Measuring window</i>	The 'measuring window' is the time during which a logger is programmed to carry out measurements, e.g. from 2 a.m. until 4 a.m. in the morning. A measuring window could also be referred to as a 'measuring day'.
<i>Measuring period</i>	A measuring period refers to the time span that passes between programming and reading a logger. A measuring period can therefore last 1 to 100 measuring days.
<i>Transmission window</i>	The time period in which a device is programmed to receive and send signals is called the transmission window. Because maintaining the wireless availability has a negative impact on the battery lifespan, it can be limited to a certain period in a day and certain days of the week, for example Monday to Friday from 8 a.m. to 1 p.m. respectively. The device cannot be reached by wireless signals outside this time.
<i>Leak threshold</i>	There is a certain basic noise level in each pipe system. This basic noise level is referred to as the 'leak threshold'. This level may be known or estimated based on experience. If the lowest measured noise level in a section of pipe is above the leak threshold, there is presumed to be a leak.
<i>Leak noise</i>	The quietest recording in a measuring period is referred to as 'leak noise'. This term should not however be taken literally. It merely states that the noise recorded could originate from a leak.
<i>Leak value</i>	The term 'leak value' combines the three measurement results – level, frequency and ESA value – determined for the quietest noise in a measuring period.
<i>Leak status</i>	If the level of the quietest noise in a measuring window is above the previously found leak threshold (see above), the logger goes into 'leak status'. This means, for example, that when this logger is read, a warning appears on the reader indicating that there is an increased probability of a leak close to the logger.
<i>Configuration mode</i>	If a noise logger has been switched off (i.e. it has stood 'on its head' for at least 3 minutes), it is in 'configuration mode' after it is switched back on. This means: <ul style="list-style-type: none">• The previous programming has been deleted. The logger is now unprogrammed.• Switching off has not deleted the previously saved measurement results. They are still in the logger's memory and can be accessed by a reading device. However, this is only possible by single interrogation (see page 62).• The logger is ready for wireless operation and waiting to be contacted by the Commander or PC. The logger remains in configuration mode until it is reprogrammed.
<i>Identification number</i>	Each device in the Sebalog N-3 series has a unique serial number (SN). You will find it on the type plate of the device. All loggers, repeaters and GSM boxes also have an identification number (ID) which can be used by the Commander or the SebaDataView software to manage them. You will also find the ID on the type plate, or on a separate plate on the device. The identification number is identical to the last six digits of the serial number. In many cases, you have a choice of entering the ID of the device concerned either manually, or using the function 'Automatic detection' (see page 30). When inputting an ID, the preceding zero digits can be omitted. Thus, if the ID is '000815', you need only enter '815'.

4 The loggers

4.1 Function

The noise loggers are installed along a section of pipe directly on the pipe, or directly on fittings on the pipe.

Within the configured measuring window, they perform regular noise measurements, each 3 seconds in length. The volume level and frequency of each measurement are saved in the logger. While the noise level alone only records the general existence of a leak, together with the frequency it also provides information on the approximate distance in relation to other loggers.

The measurement results gathered by the logger can be queried later using a reading device (Commander/Reader/PC).

The quietest noise of the last measuring window is saved as an audio file. After reading out the data, you can actually listen to the assumed leak noise and immediately decide if it is a leak noise or background noise.

With the 'Real time measurement' function (see page 71) a measurement with a logger can be performed and 'live' observed.

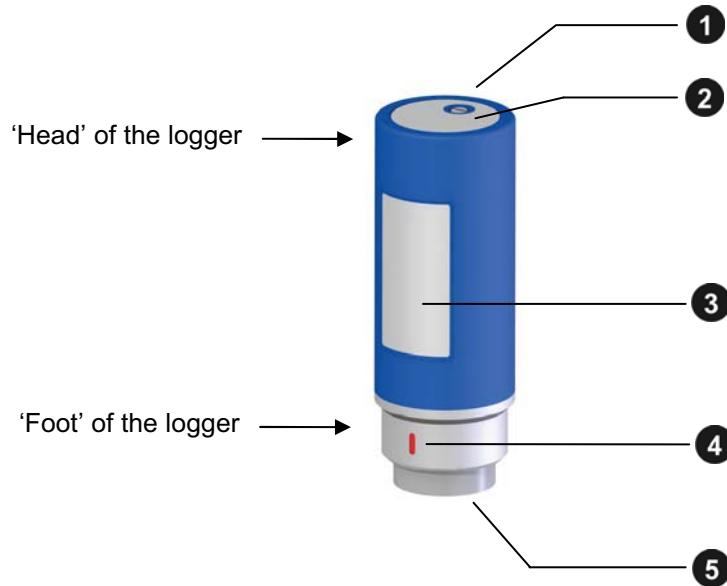
With the 'Direct recording' function (see page 77) a logger can be used to listen to a noise in a pipe.

Communication with the loggers is performed with short range radio only.

4.2 Design

Introduction All noise loggers have a highly sensitive microphone with a large dynamic range, a data memory and a lithium battery inside. The standard loggers also have an internal radio antenna.

Standard version The loggers have the following external characteristics:



Element	Description
1	Hole (M5 thread) For fitting the supplied ring, which can be used for carrying the logger and pulling it out of the shaft.
2	Label with identification number (ID) Each logger has its own six-digit identification number.
3	Type plate The last six digits of the serial number (SN) on the type plate of the device are identical to the ID.
4	Marking Must always face upwards when the logger is fitted horizontally.
5	Magnetic foot Can be unscrewed and replaced by an adapter, or similar, from the assembly accessories.

TNC version The special TNC version of loggers have no internal antenna. Instead of the hole for the assembly ring 1 they have an antenna socket for connecting an external antenna.

4.3 Switching on and off

The noise loggers have an internal tilt switch and are switched on and off simply by turning them over.



Loggers standing on their foot are
switched on.



Loggers standing on their head for longer
than 3 minutes are **switched off**.



Each time a logger is switched on, its configuration data is reset to the default values. The time internally is also lost. Therefore, whenever the logger is switched back on, it must be reprogrammed (see page 57).

4.4 Memory

A logger's internal memory allows a maximum of 100 pairs of values (the level and frequency of a measurement) to be recorded.

Furthermore, the quietest recording of the last measuring window is saved as an audio file (3 seconds in length).

Circular buffering is used, with the oldest stored measuring window being deleted after 100 measurements.

4.5 Power supply

Each logger has an internal lithium battery.

Battery life The actual battery lifetime depends on the intensity of use.

If a logger is always operated using the default configuration data, factory-set in the Commander, a battery lifetime of up to 5 years is possible.

Longer measuring periods and increased wireless activity/availability shorten the life of the logger battery. Severe fluctuations in climatic conditions also have a negative impact.

Battery status To determine the current charge status of a logger battery, you can read out the configuration of the logger concerned (see page 79) using the commander. In the **Status** line, a colour battery symbol indicates the battery status:

- Green ... Charge level very good
- Yellow ... Charge level good
- Red ... Battery weak

Information about a weak battery is also provided at the following points.

- During read out of the measured data, a battery symbol appears on the commander screen.
- In menus like these, in which the loggers in a workgroup are listed, a battery symbol appears to the far right in the line for the logger concerned. The comment text also appears against a pale red background.

Flat batteries cannot be recharged. They must be replaced.



SebaKMT or an authorised service partner must change the batteries. Otherwise, water- and dirt-resistance of the logger cannot be guaranteed.

4.6 Installing the loggers

Basics Install the loggers of the workgroup in succession along the stretch of pipe. It is best to fit them directly on the pipe. However, you can also attach the loggers to valve rods or hydrants, for example, or any other position along the pipeline that is easily accessible.

There must be the best possible contact between the logger foot or the mounted adapter (see below) and the pipe.

If the logger is attached to a valve rod, for example, make sure the surface is as flat as possible. Clean the rod thoroughly (preferably with a wire brush).

Horizontal installation Due to their powerful magnet, the loggers can also be attached horizontally to ferromagnetic surfaces. You must however make sure the red mark on the logger is facing upwards. Otherwise the internal tilt switch will switch the logger off after 3 minutes.

Loggers with the mark facing upwards are switched on.



Loggers with the mark facing downwards are switched off.

Special cases If the logger cannot be attached anywhere directly, the accessories for the Sebalog N-3 set have various adapters.

If, for example, the surface of the valve rod is not flat, or not magnetic, unscrew the magnet on the foot of the logger and fit the 20 mm or 42 mm valve rod adapter (optionally available) instead.

When installing the logger on an underground hydrant, you can fit it on the valve rod or on the side of the rod, depending on the height of the shaft. Use the magnetic angle adapter, for example, for side mounting.

Installation examples The following pictures show a few methods for installing N-3 noise loggers:



Logger on the valve rod of an underground hydrant



Logger on an underground hydrant



Logger with an angle adapter on the valve rod



Logger with an angle adapter on the hydrant claw



Logger with an angle adapter horizontally on the valve rod

5 The Commander

5.1 Function

The Commander-3 is the mobile programming and reading device for noise loggers in the Sebalog N-3 series. The Commander is used to program the noise loggers before measuring. After measuring, the recorded data in the loggers can be queried with the Commander. Both current and older data can be displayed on the device's screen and analysed in greater detail. Furthermore, a real time measurement can be performed (see page 71).

After connecting the supplied headphones, you can play back audio files of leak noises. It is also possible to listen to the current noise in a pipe (see page 77).

5.2 Device design

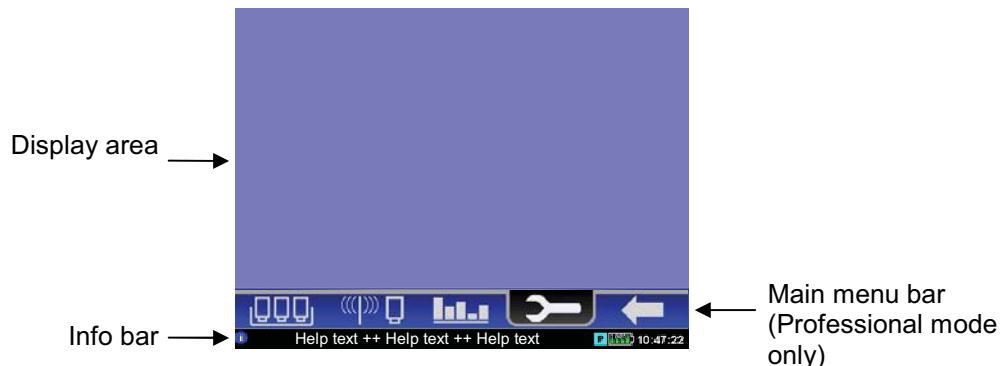
Controls and connections The Commander has the following controls and connections:



Element	Description
6	Selector knob
7	ESC button
8	I/O button <ul style="list-style-type: none"> • Device on/off • Backlight on/off
9	Charging indicator light Lights up red ... external supply, battery is being charged
10	Socket for USB link to PC and for connecting an optional GPS module (combined)
11	Headphone and charging socket (combined)
12	Antenna socket

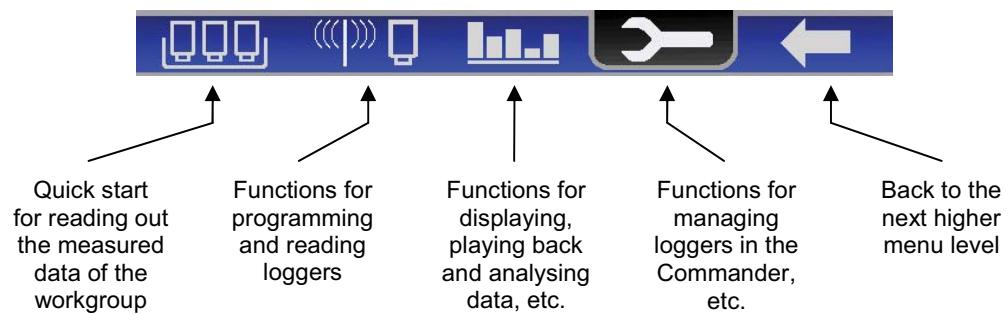
5.3 Design of the user interface

All the menu levels on the Commander's user interface consist of a large display area and an infobar on the bottom edge of the screen. The content and structure of the display area change depending on the system status.



Main menu In Easy mode, the main menu can be selected in the display area of the start screen.

In Professional Mode, the 'Main menu bar' is between the display area and infobar. You can access the individual functions of the device using the symbols shown.

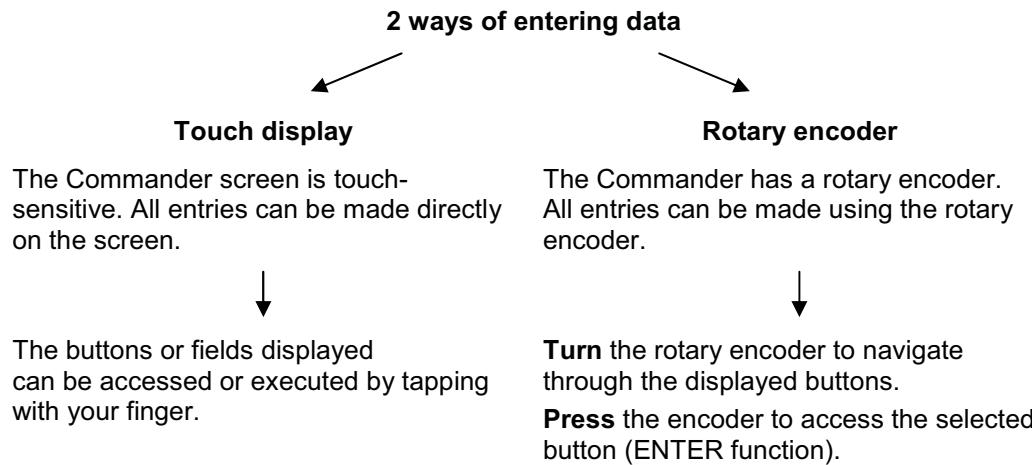


Info bar The info bar structure remains the same in each menu and continuously provides the user with the following information (from left to right):

- A help text gives short explanations on the selected element or on how to proceed further.
- A coloured symbol indicates the group mode of the workgroup (see page 19)
 - L** ... 'Lift&Shift'
 - P** ... 'Patrol'
 - N** ... 'Network'
- The battery symbol indicates the charge level of the battery.
- The Commander's internal time.

5.4 Basics of operation

Input Entries can be made directly on the screen or via the rotary encoder.



You can always switch between operating via touch screen and operating via rotary encoder.

Enable/disable touch function The touch function of the screen can be disabled/enabled if needed. The screen will no longer respond to tapping. The device can only be operated using the rotary encoder.

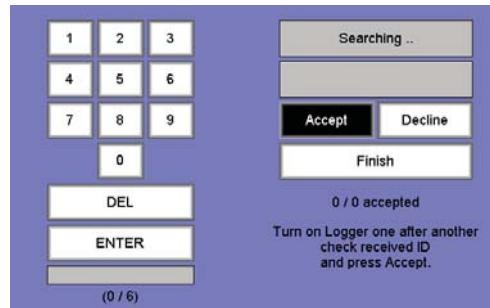
To enable/disable the touch function, proceed as follows:

Step	Description
1	In the main menu, select the button  .
2	In the displayed menu, select the System settings button. Result: The system settings menu is opened. Use the buttons Next and Previous to browse through the available settings.
3	Look for the Touch option. Enable/Disable the corresponding checkbox.

ESC / Back button By pressing the **ESC** pushbutton of the Commander you can cancel or end any process. The button closes the displayed menu and opens the start menu.

You can use the Back button  in the main menu to return to the previous menu level.

Entering identification numbers Various functions require the identification numbers (IDs) of loggers, repeaters or GSM boxes to be specified. You can find the ID on the device type plate, or on an extra sticker. It can be entered in the following screen view, or a similar one, which opens:



- DEL** ... deletes last character
- ENTER** ... confirms and completes input
- Accept** ... accepts and enters automatically detected ID
- Decline** ... does not accept automatically detected ID
- Finish** ... completes the automatic detection

For the 'Manual entry' of IDs, the number field displayed is used.



When inputting an ID, the preceding zero digits can be omitted. Thus, if the ID is '000815', you need only enter '815'.

To the right of the number field, there are fields and buttons for the 'Automatic device detection' function. The devices concerned must be switched off for this, and be close to the commander. Directly after switching on a device, its ID is detected and displayed by the commander. Using the corresponding buttons, the ID detected can be accepted for entry, or rejected. This allows a large number of device IDs to be detected in succession quickly and entered in the commander, for example the IDs of one logger group.

Entering text To input comments or similar, a virtual keyboard appears on the screen, which is also operated with the selector knob.



- DEL** ... deletes last character
- SHIFT** ... switches between upper- and lower-case
- SPACE** ... inserts space
- ENTER** ... confirms and completes input

Sorting loggers Various menus list the individual loggers of a logger group. This appears in a table-like form. You are able to re-sort these loggers by the criteria 'Comment', 'Time of data read-out' or 'ESA value'. This can be useful for identifying certain loggers straightaway, e.g. all loggers where a leak is suspected, etc.

To change the sort, apply the **Sort** button repeatedly. A small triangular symbol in the header of a column indicates which criterion is selected and whether the loggers are arranged in descending ▼ or ascending ▲ order.

Examples of possible settings:

- 'ESA ▼' ... sorting by ESA value (descending),
i.e. the loggers with a suspected leak are at the top of the list
- 'Date/time ▼' ... sorting by time of the data read-out (descending),
i.e. the loggers most recently read are at the top of the list
- 'Date/time ▲' ... sorting by time of the data read-out (ascending),
i.e. the loggers not yet read are at the top of the list

5.5 User mode

Introduction The Commander-3 can be operated in two different user modes.

Easy mode	Professional mode
In Easy mode all the main functions of the device are available. They can perform most day-to-day work quickly and simply - from programming a logger group to analysing measured data on the Commander. The individual applications are structured very clearly; the user is partly guided step-by-step from one action to the next. Easy mode is therefore not just suited to first-time users but also experienced operators who prefer to use its simpler menu structure.	In Professional mode all the functions of the device are available to the user. This allows the system to be better adapted to the user's requirements and conditions on site. Difficult measurements can be prepared more exactly and the results evaluated and documented in more different ways, etc. Some applications can only be used in Professional mode, such as using Repeaters or building a logger network.

How to identify the user mode? If the Commander is in Easy mode, the following symbol is permanently displayed above the infobar:



If the EasyGo symbol isn't shown on the screen, the Commander is in Professional mode.

How to change the user mode? The user mode can be switched in the system settings (see page 33).

5.6 Making a connection

5.6.1 Connection between the Commander and logger

Short range radio is used for communication between the Commander and loggers.

The Commander has an integrated radio module. After the antenna is connected (standard or vehicle antenna), the device is ready for wireless operation.

The loggers must be switched on and wirelessly available (see page 59). The radio range of a logger is affected by the conditions where it is used. To extend the range a repeater can be used (see page 84).

5.6.2 Connection between the Commander and PC

Purpose The connection between the Commander and a PC/laptop is made using the VK77 connection cable supplied and is needed for the following tasks:

- Transferring measured data from the Commander to the PC.
- Transferring configuration data from the Seba DataView-3 software to the Commander.
- Installing a firmware update on the Commander.

Making a connection The Commander must be operated in Professional mode to connect it to the PC. Proceed as follows:

Step	Description
1	Select the  button in the main menu bar.
2	In the next menu, select the Connect to PC button.
3	Use the USB socket 10 on the Commander for connecting the cable to the PC. Markings on the plug and socket ensure that the plug is lined up correctly. You must feel the plug engage.
4	Select the Connect button on the Commander. Result: The connection is made. The Commander is automatically detected by the PC as a mass storage device. As soon as the Connected message on the Commander's screen appears, data can be transferred between the Commander and PC.

If no connection is made, check the cable connection again. If necessary, disconnect the Commander from the PC, restart it again, or perform a reset, and follow steps 1 to 4 once again.

Disconnection To end the connection, select the **Disconnect** button on the Commander.

As soon as the **Disconnected** message on the Commander's screen appears, the connection cable can be removed.

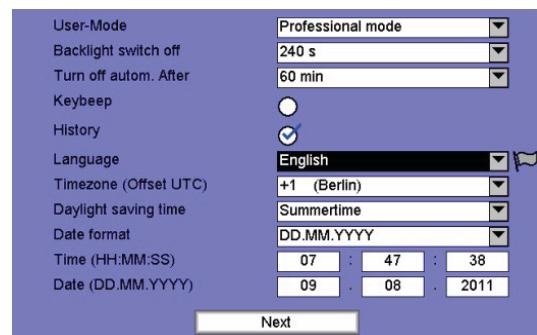
5.7 Switching on the display lighting

The Commander's screen has a backlight. It is activated by using the selector knob or briefly pressing the **I/O** button 8. The lighting then remains on for a certain time period. The length of this period (a maximum of 4 minutes) can be adjusted in the system settings.

5.8 System settings

You can use the **System settings** menu to customise various device settings to the needs of the user.

Beginning at the start screen, follow the   symbols. The **System settings** menu opens:



When the Commander is in Professional mode, more settings can be changed than in Easy mode. Use the **Next** button to go to the second page of the menu.

5.8.1 Basic settings

The following basic settings can be made in both Professional mode and Easy mode:

Line	Description
User mode	Select a user mode (see page 31) for the device.  While a network group is registered as a workgroup (see page 20) in the commander, it is not possible to access Easy mode.
Language	Select a language for the user interface.  If you cannot read the preset language, you can go to the language selection - starting from the main menu - via the following symbols: 
Time and date settings	In the Timezone line, select the timezone for where you are. In the Daylight saving time line select whether it is currently winter or summer time. In the Date format line, select the date format to be used by the Commander. (DD ... Day - MM ... Month - YYYY ... Year) In the Time line, enter the current time for the Commander (hour:minutes:seconds). In the Date line, enter the current date for the Commander (day:month:year).
Backlight switch off	Select a period of time for the backlight until it is switched off automatically (never = continuous backlight).
Turn off autom. after	Select a period of time for the auto-off function. If no entry is made for longer the specified time, the Commander switches off automatically (never = automatic switch off deactivated).
Keybeep	Activate/deactivate the key tone that sounds when the selector knob is pressed.
History	Activate/deactivate the 'History' function. If the 'History' function is activated, the measured data from loggers remains stored in the Commander after they are read out. They can then be called up at any time and displayed again. If the function is deactivated, the previous data set is overwritten when new data is read. Deactivating the function can be useful because this saves memory space and the Commander can work faster in certain situations.
Touch	Enable/Disable the touch function (touch sensitivity) of the screen. If this function is disabled, the screen only works as a display. The device can only be operated using the rotary encoder.

5.8.2 Extended settings in Professional mode

The following extended settings are only available in Professional mode:

Line	Description																																																																																																																											
Leak value highlighting	<p>Determining the meaning of the coloured background to the measured values in logger lists</p> <p>The individual loggers in a logger group are listed in a table in various menus. If the values measured by a logger appear with a coloured background (except for 'grey'), then this indicates a high probability of a leak in the measuring period concerned. This means that the level of the leak noise during the measuring period has exceeded the set leak threshold.</p> <p>The meaning of the colour itself can be set here. The following settings can be made using the drop-down menu:</p> <p>All columns ESA color</p> <p>The coloured background roughly mirrors the ESA value of the leak noise:</p>  <table border="1" data-bbox="1293 707 1452 887"> <tr> <th>ESA</th> <th>Level</th> <th>f/Hz</th> </tr> <tr><td>5</td><td>5</td><td>50</td></tr> <tr><td>47</td><td>28</td><td>350</td></tr> <tr><td>2</td><td>2</td><td>50</td></tr> <tr><td>93</td><td>54</td><td>400</td></tr> <tr><td>73</td><td>39</td><td>700</td></tr> <tr><td>57</td><td>43</td><td>100</td></tr> <tr><td>17</td><td>11</td><td>250</td></tr> <tr><td>95</td><td>55</td><td>400</td></tr> </table> <p>Only ESA</p> <p>The coloured background roughly mirrors the ESA value of the leak noise:</p>  <table border="1" data-bbox="1293 909 1452 1089"> <tr> <th>5</th> <th>5</th> <th>50</th> </tr> <tr><td>47</td><td>28</td><td>350</td></tr> <tr><td>2</td><td>2</td><td>50</td></tr> <tr><td>93</td><td>54</td><td>400</td></tr> <tr><td>73</td><td>39</td><td>700</td></tr> <tr><td>57</td><td>43</td><td>100</td></tr> <tr><td>17</td><td>11</td><td>250</td></tr> <tr><td>95</td><td>55</td><td>400</td></tr> </table> <p>Only level</p> <p>The coloured background roughly mirrors the volume of the leak noise:</p>  <table border="1" data-bbox="1293 1111 1452 1291"> <tr> <th>5</th> <th>5</th> <th>50</th> </tr> <tr><td>47</td><td>28</td><td>350</td></tr> <tr><td>2</td><td>2</td><td>50</td></tr> <tr><td>93</td><td>54</td><td>400</td></tr> <tr><td>73</td><td>39</td><td>700</td></tr> <tr><td>57</td><td>43</td><td>100</td></tr> <tr><td>17</td><td>11</td><td>250</td></tr> <tr><td>95</td><td>55</td><td>400</td></tr> </table> <p>Only frequency</p> <p>The coloured background roughly reflects the frequency of the leak noise:</p>  <table border="1" data-bbox="1293 1313 1452 1493"> <tr> <th>5</th> <th>5</th> <th>50</th> </tr> <tr><td>47</td><td>28</td><td>350</td></tr> <tr><td>2</td><td>2</td><td>50</td></tr> <tr><td>93</td><td>54</td><td>400</td></tr> <tr><td>73</td><td>39</td><td>700</td></tr> <tr><td>57</td><td>43</td><td>100</td></tr> <tr><td>17</td><td>11</td><td>250</td></tr> <tr><td>95</td><td>55</td><td>400</td></tr> </table> <p>Every column with own color</p> <p>The coloured background mirrors the respective level of the measured value in each column.</p> <table border="1" data-bbox="1293 1493 1452 1650"> <tr> <th>5</th> <th>5</th> <th>50</th> </tr> <tr><td>47</td><td>28</td><td>350</td></tr> <tr><td>2</td><td>2</td><td>50</td></tr> <tr><td>93</td><td>54</td><td>400</td></tr> <tr><td>73</td><td>39</td><td>700</td></tr> <tr><td>57</td><td>43</td><td>100</td></tr> <tr><td>17</td><td>11</td><td>250</td></tr> <tr><td>95</td><td>55</td><td>400</td></tr> </table> <p>Logger found beep</p> <p>Switch the acoustic signal on/off that occurs when a logger is found.</p> <p>An acoustic signal sounds each time the Commander detects a logger when reading out data. A corresponding message is shown briefly on the screen.</p> <p>When 'patrolling', this can happen several times in succession because the loggers send data packets to the Commander at regular intervals.</p>	ESA	Level	f/Hz	5	5	50	47	28	350	2	2	50	93	54	400	73	39	700	57	43	100	17	11	250	95	55	400	5	5	50	47	28	350	2	2	50	93	54	400	73	39	700	57	43	100	17	11	250	95	55	400	5	5	50	47	28	350	2	2	50	93	54	400	73	39	700	57	43	100	17	11	250	95	55	400	5	5	50	47	28	350	2	2	50	93	54	400	73	39	700	57	43	100	17	11	250	95	55	400	5	5	50	47	28	350	2	2	50	93	54	400	73	39	700	57	43	100	17	11	250	95	55	400
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Line	Description
	<p>You can specify how often there is a signal or a message:</p> <ul style="list-style-type: none"> • always ... acoustic signal each time the Commander detects a logger • only once if logger found ... acoustic signal only when a logger is detected the first time • never ... no acoustic signal • beep and display only once ... acoustic signal and message on the screen only when a logger is detected the first time
Additional hints	<p>Decide if additional information shall be shown or not.</p> <p>At various positions in the menu, special displays appear on the screen, providing additional information about the current functions. These displays can be deactivated.</p>
Time from GPS	<p>Activate/deactivate digits in the time using GPS</p> <p>If this checkbox is marked and the GPS module is connected to the commander, then the internal commander clock is automatically synchronised with the GPS time. This occurs every time the device is switched on, or every time the GPS module is connected.</p>
Sorting order	<p>Select the standard sorting order for loggers in tables.</p> <p>Various menu levels list the loggers of a group in a table on the screen. The criterion by which the loggers are sorted within the table as standard can be specified..</p>
Factory settings	<p>Restore factory settings.</p> <p>The settings on the Commander can be reset to the factory settings, to the state when the Commander was delivered.</p>

5.8.3 System info

When the Commander is operated in Professional mode, the **System settings** menu has the following information on the device and the firmware currently in use:

Line	Description
Free space	Commander's free memory space in MB
Software version	Firmware version of the Commander
Software date/time	When the firmware was last updated
ID	Identification number of the Commander

5.8.4 Saving settings

To save any changed settings in Easy mode, apply the **OK** button before exiting the **System settings** menu with the **ESC** button 7.

In Professional mode, saving is automatic when exiting the menu.

5.9 Performing a hardware reset

If the Commander stops responding to inputs (from the selector knob or buttons), a hardware reset can be performed.

Hold down the selector knob **6** and the ESC button **7** at the same time for about one second. The Commander restarts automatically. This usually rectifies the malfunction.

If the malfunction persists after this normal reset, try the following: Hold down the selector knob **6** and the ESC button **7** at the same time for about three seconds. The Commander switches off. Wait about a minute before switching the Commander back on with the I/O button **8**. The device should now function correctly again.

5.10 Updating the firmware

Introduction Visit regularly the Downloads section at www.sebakmt.com for information about new versions of firmware. You can install any updated versions of the firmware on the Commander if they are available.

The current version of the Commander firmware installed can be found in the system settings (see page 33).

Procedure To update the firmware, proceed as follows:

Step	Description
1	First ensure that the Commander's battery has sufficient power to update the firmware (at least one bar on the battery symbol on the infobar (see page 28)). If in doubt, recharge the battery first.
2	Download the latest firmware archive from www.sebakmt.com and extract it to a directory on your PC.
3	Connect the PC and Commander together via USB (see page 32).
4	Copy the extracted files directly into the Commander's main directory.
5	Disconnect the Commander from the PC.
6	Switch the Commander off and then on again, or perform a reset (see above). Result: The firmware update begins. A bar indicator shows the progress on the screen.
<div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>CAUTION</p> <p>During the update, no entries whatsoever must be made on the Commander! This could cause the device irreparable damage.</p> </div> </div> </div>	
<p>After the procedure is complete, the device switches back on automatically. Check the version number in the start screen to see if the Commander is actually using the new firmware.</p>	

5.11 Memory

The Commander has a 2 GB internal memory. This is sufficient to manage the data of up to 1,000 logger groups, each with 1,000 loggers.

You can query the available memory space at any time in the system settings (see page 33).

5.12 Power supply

Internal supply The Commander is fitted with an internal Li-ion rechargeable battery. This can power the device for approximately 20 hours. The battery's present charge level is shown continuously by the battery symbol in the infobar on the screen.

If the battery is low, a warning on a coloured background appears on the screen:

Yellow background ... device can still operate for a few hours

Red background + warning sound ... device will shortly switch off

External supply The Commander can be operated using an external electricity source. Connect it to the mains voltage or to your vehicle's 12 volt socket. A guide on the round plug of the charging cable and a groove on the charging socket 10 of the Commander specify the correct alignment of the plug.

As soon as the Commander is connected to the external power supply, its battery is charged up automatically. This is shown by the red charging indicator light 9 and by the arrow in the battery symbol at the bottom right of the screen. Charging takes approximately 12 hours. The battery is fully charged once four bars are shown in the battery symbol. After the battery is fully charged, the Commander switches to trickle charging.



During charging, the ambient temperature should be between 10°C and 40°C (50°F and 104°F). Otherwise the device could be damaged!

Only use the supplied connection cables to connect the Commander to external power sources.

If you experience problems with the battery, please contact your SebaKMT sales partner. Do not open the device yourself. The stated water- and dirt-resistance can only be guaranteed if any work on the device is performed solely by service departments authorised to do so.

Automatic switch off The Commander automatically switches off if no input is made within a specified time period. This timespan can be configured in the system settings (see page 33)

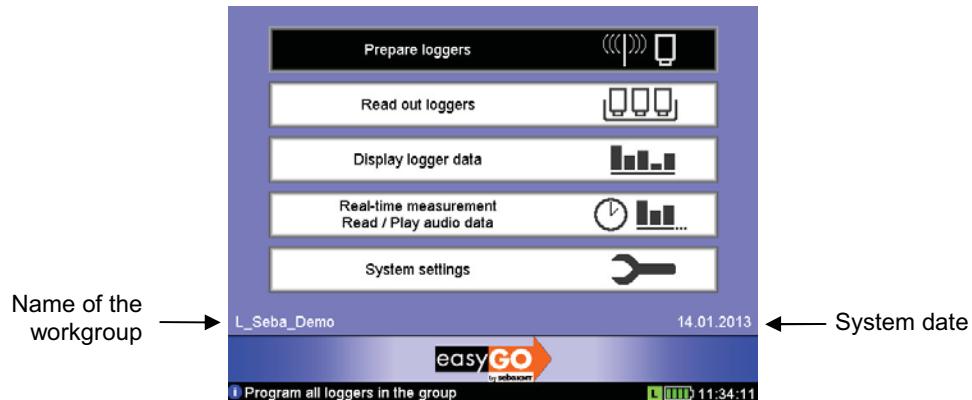
6 Working in Easy mode

6.1 Starting up the Commander

6.1.1 Switching on the Commander

Switch on the Commander by pressing the I/O button 8.

The Easy mode main menu appears on the screen:



Changing the user mode In Easy mode, the  symbol is continuously shown at the bottom of the screen. If you do not see this symbol, the Commander is in Professional mode. To switch to Easy mode, open the system settings menu. Starting from the start screen, follow the  →  symbols and, in the first line of the menu, select the 'Easy mode' setting from the list.

Changing the language The screen might not be displaying the correct language. The language can be changed in the system settings menu. Beginning at the start screen, follow the  →  →  symbols and select your language from the list.

6.1.2 Checking the basic settings

Before a measuring session, check that the Commander's system settings (see page 33) are up-to-date and correct. The date and time settings in particular must be correct.

Beginning at the start screen, follow the  →  symbols to open the system settings menu.

6.1.3 Defining a workgroup

More than one group of loggers can be registered in the Commander. However, the Commander can only work with one of these groups at a time. This group is called the 'workgroup'.

Specify the workgroup for the impending measurement session. Please proceed as follows:

Step	Description
1	In the main menu, select the System settings  button.
2	In the next menu, select the Change group button. Result: A list with all the registered logger groups opens. The current workgroup is indicated by an X .
	
3	Select a logger group for the measurement session. Result: The selected group is now registered in the Commander as the workgroup. In the main menu, the name of the workgroup is shown at the bottom left of the display area.



Each logger group in the list has already been assigned its group mode (see page 19):

Groups with an 'L' before the name are 'Lift & Shift' groups.

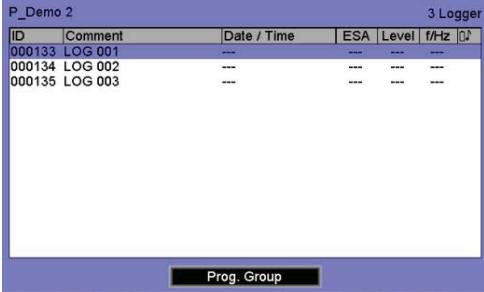
Groups with a 'P' before the name are 'Patrol' groups.

Groups with a 'N' before the name are 'Network' groups.

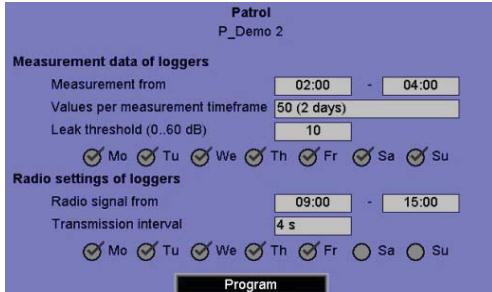
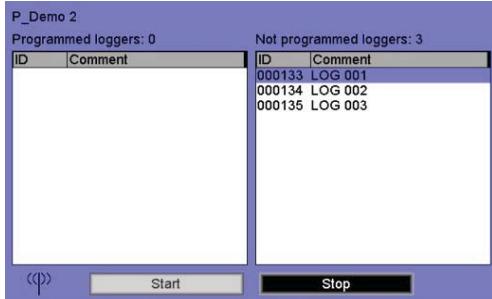
6.2 Programming the loggers

Introduction The loggers in the workgroup must be reprogrammed before each session. This means that the Commander sends basic data for the session wirelessly to the loggers (e.g. the measuring window).

Procedure To program the workgroup proceed as follows:

Step	Description
1	<p>In the main menu, select the Prepare loggers   button.</p> <p>Result: The workgroup is shown. The name of the group is at the very top of the display, and all the loggers in the group are listed underneath.</p> 
2	<p>Select the Prog. Group button.</p> <p>Result: The next step is shown.</p> 
3	<p>Switch off all the loggers in the group, i.e. place them 'on their head' for about three minutes. As an aid, a three-minute countdown on the screen can be started with the Start button.</p> <p>Then select the OK button.</p> <p>Result: The next step is shown.</p> 

(continued on the next page)

Step	Description
4	<p>Switch on all the loggers in the group, i.e. place them 'on their foot'. Select the OK button to confirm.</p> <p>Result: The next display provides information about the measuring and radio settings used to program the loggers.</p>
	
	<p>(It is not possible to change this configuration data in Easy mode).</p>
5	<p>Select the Program button.</p> <p>Result: The next display opens and the Commander automatically begins transferring data to the loggers.</p>
	
	<p>The flashing antenna symbol on the bottom left of the display area indicates that radio is active. The left-hand window shows all the loggers in the group already programmed. The right-hand window contains all the loggers with which no contact has yet been possible.</p> <p>The Stop button can be used to cancel programming at any time. It can be recommenced with the Start button.</p> <p>The procedure ends automatically once all the loggers in the group have been successfully programmed.</p> <p>The loggers are now ready to be installed for use on location.</p> <p>Use the ESC button 7 to return to the main menu.</p>



From now on, do not place the loggers on their head because switching off would cause them to lose their configuration data and they would need to be reprogrammed.

Possible sources of error If a logger could not be programmed, it may be because it was not in 'Configuration mode' (see page 20) at the time of programming, i.e. it had not been properly switched off and switched back on 3 minutes later. It is also possible that the logger is not within the wireless range of the Commander. The ideal distance between a logger and the Commander is about one meter.

6.3 Deploying loggers

For detailed information, please refer to the logger installation section (see page 24).

6.4 Reading out the measured data

After the loggers have been installed on location for at least one measuring day, the recorded data can be read out with the Commander. The exact same group mode ('Lift&Shift'/'Patrol'/'Network') for which the workgroup was programmed is used.

Groups with an 'L' before the name can only be read using 'Lift & Shift', i.e. all the loggers in the group are collected and then read together.

Groups with a 'P' before the name can only be read using 'Patrol', i.e. all the loggers in the group remain in the shaft and are read on location individually.

The loggers of a group with an 'N' before the name are networked together and connected to a GSM-Box. These loggers can't be read by a reading device but send their data regularly to a FTP server.

6.4.1 Reading out a 'Lift&Shift' group

To read out the measured data in the loggers, proceed as follows:

Step	Description
1	<p>Collect up all the loggers of the group and place them next to the Commander.</p> <p>Info: Avoid placing the loggers on their head! The stored data would not be lost if the loggers were switched off, but it would no longer be indicated if a logger is in leak status or not (see page 20).</p>
2	<p>In the main menu of the Commander, select the Readout loggers button.</p> <p>Result: The Commander and the loggers are connected. Data transfer begins automatically. The antenna symbol in the bottom left of the display flashes.</p> <p>As soon as the Commander detects a logger, it receives its measured data. The corresponding logger switches from the right-hand to the left-hand window on the screen.</p> 

(continued on the next page)

Step	Description
	<p>The coloured background of the read data in the left-hand window reflects the probability of a leak.</p> <p>No colour ... Leak probability low, leak threshold was not exceeded</p> <p>Grey ... Leak probability not available, logger in configuration mode (since it was switched off during or after measurement)</p> <p>Other colour ... Leak probability high! Leak threshold exceeded! The colour reflects approximately the frequency of the leak noise:</p> 
	<p>If a logger's comment is on a red background, this means that its battery is weak.</p> <p>3 The Stop button can be used to cancel reading at any time. It can be continued with the Start button. The procedure finishes automatically once the Commander has received and saved the measured data from all the loggers in the group. If a logger could not be read, it may have been switched off, not ready for wireless operation or it was outside the Commander's wireless range.</p>
4	<p>You can immediately view the data of a logger that has just been read. To do so, select the left-hand window on the screen and then select the respective logger.</p> <p>Result: The logger's measured data is shown (see page 48). Use the ESC button 7 to return to the main menu.</p>

6.4.2 Reading out a 'Patrol' group

To read out the measured data in the loggers, proceed as follows:

Step	Description
1	<p>In the main menu of the Commander, select the Patrol Loggers button.</p> <p>Result: The Commander is ready to receive the measured data from the individual loggers. The antenna symbol in the bottom left of the display flashes.</p>
2	<p>Move into the wireless range of each logger one after the other.</p> <p>If the radio signals of the loggers are strong enough, the data can also be collected while in the car, simply by driving past where the loggers are installed. The Commander's standard antenna can be replaced with the supplied vehicle antenna to do this.</p> 

As soon as the Commander has detected a logger, the following message appears on the screen:

LOG 001
000133
11 dB / 30 Hz
via Logger

← Logger comment
← Logger ID
← Level/frequency of the quietest noise in the measuring period

The message has a coloured background. The colour shows straightaway whether the programmed leak threshold has been exceeded or not during the measuring period.

Yellow ... Attention! Leak threshold exceeded!

Blue ... Leak threshold not exceeded.

There is an acoustic signal along with the message:

Long tone ... Attention! Leak threshold exceeded!

Short tone ... Leak threshold not exceeded.

As standard, the tone sounds each time a logger is detected. It can be deactivated in the system settings of Professional mode (see page 35).

If the displayed message contains a battery symbol, this means the battery of the particular logger is weak.

(continued on the next page)

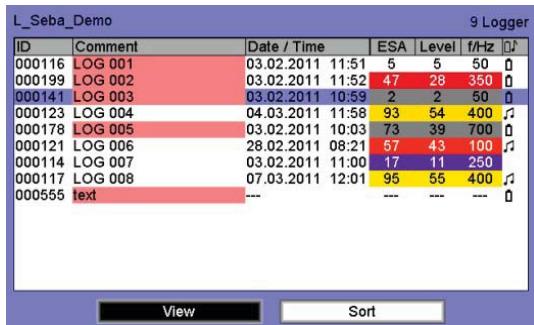
Step	Description
	<p>If the displayed message contains a clock symbol, this means the logger's internal clock differs from the system time of the reading device by more than 30 minutes. The logger group concerned should be reprogrammed. The logger's clock is synchronised with that of the Commander. It is only possible to change the time of individual loggers in Professional mode.</p>
	<p>The detected logger switches from the right-hand to the left-hand window on the Commander screen. The coloured background of the read data reflects the probability of a leak.</p>
	<p>No colour ... Leak probability low, leak threshold was not exceeded</p>
	<p>Grey ... Leak probability not available, logger in configuration mode (since it was switched off during or after the measurement)</p>
	<p>Other colour ... Leak probability high! Leak threshold exceeded!</p>
	<p>The colour reflects approximately the frequency of the leak noise:</p>
	
	<p>If a logger's comment is on a red background, this means its battery is weak.</p>
3	<p>The Stop and Start buttons can be used to cancel and continue reading at any time.</p>
	<p>The procedure finishes automatically once the Commander has received and saved the measured data from all the loggers in the group.</p>
	<p>Information: During 'Patrolling', the complete measured data set is only transferred to the Commander from loggers in leak status (see page 20). To save power, if the quietest noise in a measurement is below the programmed leak threshold, the loggers will only send a small packet to the Commander, with the level and frequency of this noise. If necessary, the complete measured data of these loggers can be called up using single interrogation in Professional mode (see page 62).</p>
	<p>If a logger could not be read, it may have been switched off, not ready for wireless operation or it was outside the Commander's wireless range.</p>
4	<p>You can immediately view the data of a logger that has just been read. To do so, select the respective logger in the left-hand window on the screen.</p>
	<p>Result: The logger's measured data is shown (see page 48). Use the ESC button 7 to return to the main menu.</p>

6.5 Evaluating the measured data

You can use the Commander to view the measured data read out from a logger and to analyse it in greater detail.

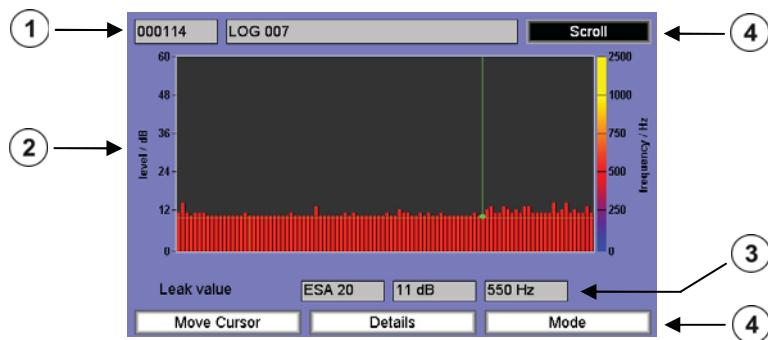
6.5.1 Calling up the measured values

To call up the measured data of a logger, proceed as follows:

Step	Description
1	<p>In the main menu, select the Display logger data  button.</p> <p>Result: The loggers in the workgroup are listed in the next view.</p> 
	<p>The time of the last data read out is displayed in the Date/Time column.</p> <p>The displayed leak value (ESA/level/frequency) of a logger can appear with a coloured background:</p> <ul style="list-style-type: none"> No colour ... Low probability of a leak at the read out time. Leak threshold has not been exceeded. Grey ... Leak probability not available. Logger was in configuration mode at the read out time (meaning the logger was switched off and then switched on again during or after the measurement). Other colour ... High probability of a leak at the read out time. Leak threshold exceeded! <p>The colour itself mirrors the level of the 'ESA value', 'noise level' or 'frequency' - depending on the settings made in the system settings of the commander (see page 35).</p> <p>If the comment text of a logger has a pale red background and a battery symbol appears at the end of the line, then this means that the logger battery is weak.</p>
2	<p>Call up the data of the highlighted logger using the View button or select another logger in the list.</p> <p>Result: The logger's measured data is shown (see page 48).</p>

6.5.2 Displaying the measured values

View The measured data from the loggers are shown as a bar diagram on the screen.



Element	Description
(1)	Identification number and comment of the displayed logger
(2)	<p>Diagram</p> <p>X-axis ... course of measurement over time</p> <p>Y-axis ... noise level in dB</p> <p>Each bar represents a single noise recording. The colour of the bar shows the approximate frequency of the noise:</p>  <p>The point where the two green lines intersect marks the quietest recording in the displayed measurement, the so-called 'leak value'.</p>
(3)	<p>Leak value (lowest value to be displayed)</p> <p>The leak value refers to the quietest recording in the displayed measuring period. The values of this recording are shown in the three fields directly under the diagram:</p>
	<p>Left-hand field ... ESA value of the quietest recording</p> <p>Centre field ... Noise level of the quietest recording (in dB)</p> <p>Right-hand field ... Frequency of the quietest recording (in Hz)</p>
(4)	<p>Buttons to access individual functions (see below)</p>

Functions There are the following functions for analyzing the displayed data:

Button	Description
Scroll	You can use this function to view in the diagram the measurement results of the other loggers in the group. To do so, apply the button and turn the selector knob to select a logger. Apply the button again to confirm your selection.
Move Cursor	You can use this function to move the vertical green line in the diagram from one bar to the next. The values of the particular noise measurement (volume, frequency, ESA) and the time of the recording are shown. To do so, apply the button and turn the selector knob. Apply the button again to end the function.
Details	This function opens a new window on the screen. It shows the configuration data of the particular logger at the time of the measurement. You can use the Scroll button to view the configuration data of the other loggers in the group. Use the OK button to return to the measured data display.
Mode	You can use this function to change the measurement unit on the Y-axis in the diagram. Standard view ... The Y-axis shows the volume of the noises. Each bar in the diagram represents a single recording. ESA view ... The Y-axis shows the ESA value (see page 19). Each bar represents the quietest recording of a measuring day.

7 Working in Professional mode

7.1 Starting up the Commander

7.1.1 Switching on the Commander

Switching on Use the **I/O button** 8 to switch on the Commander.

The Professional mode start image appears on the screen:



Changing the user mode If the  symbol is shown at the bottom in the middle of the screen, the Commander is not in Professional mode but Easy mode instead. To switch to Professional mode, open the system settings menu. Beginning at the start screen, follow the  →  symbols and, in the first line of the menu, select the 'Professional mode' setting from the list.

Changing the language The screen might not be displaying the correct language. The language can be changed in the system settings. Beginning at the start screen, follow the  →  →  symbols and select your language from the list.

7.1.2 Checking the system settings

Before a measuring session, check that the Commander's system settings (see page 33) are up-to-date and correct. The date and time settings in particular must be correct.

7.1.3 Registering loggers in the Commander and specifying the workgroup

The loggers to be used for an impending measurement must be registered and combined in a group in the Commander (see page 54).

To specify the workgroup (see page 20), select the  symbol in the main menu bar, open the **Group Management** menu and select a group in the list of registered logger groups (marked with an X).

However, a lot of menus in Professional mode also have a drop-down list at the very top of the screen. It can be used to access a group list directly and select a workgroup.

7.2 Managing the loggers

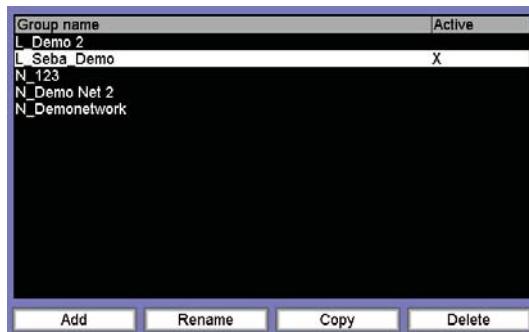
All loggers to be used for a measurement must be registered in the Commander beforehand. Only registered loggers can be programmed and read. Registration is performed either by manually inputting the logger ID or by automatic wireless detection. The registered loggers are combined in groups.

7.2.1 Managing logger groups in the Commander

Introduction All loggers registered in the Commander must be assigned to a group. The Commander can only communicate with one of the logger groups created, the so called 'workgroup'.

Managing groups Logger groups can be created, deleted, copied and renamed directly on the Commander.

Select the  symbol in the main menu, and the **Group Management** button in the next view, to go to the menu for managing logger groups. All the registered logger groups are listed.



Defining a workgroup The workgroup is marked with an **X** in the view. To turn another logger group into the workgroup, select the list and then a group.

Creating a new group To create a completely new logger group in the Commander, proceed as follows:

Step	Description
1	Select the Add button.
	Result: A new view opens.
2	Select the group mode (see page 19) for the new group and confirm with OK .
	 After the group is created, the group mode can no longer be changed. All loggers in a group must belong to the same group mode as the group itself (e.g. a 'Lift&Shift' group may only contain 'Lift&Shift' loggers).
	Result: A new view opens.

(continued on the next page)

Step	Description
3	<p>Enter a name for the new group. Use the virtual keyboard for this. To complete the input, select the ENTER button.</p> <p>Info: The name entered is automatically given a prefix 'L'/'P'/'N'. This allows the name to indicate the group mode of a group.</p> <p>Example: 'P_SebaKMT_Demo' ... is a 'Patrol' group</p>
	<p>Result: The new group is now created in the Commander. The display jumps automatically to the Logger Management menu.</p>
4	Use this menu to assign loggers to the newly created group (see page 54).

Renaming a group You can rename an existing logger group.

First select the particular group in the list and then select the **Rename** button. In the following screen views, enter a group mode and the new name (comment) of the group.

The group then appears with the new name in the group list.

Copying a group You can copy an existing logger group, with all its loggers, within the list and allocate a new name and new group mode to this copy. (This can be useful if, for example, you wish to use the loggers of an existing 'Lift&Shift' group for the next measuring assignment, but would like to read out data by 'Patrolling'.) The new group automatically adopts the configuration data of the original group but contains no measured data at all.

First select the particular group in the list and then select the **Copy** button. In the following screen views, enter the group mode and the name (comment) of the new group.

The new group then appears in the group list. If needed, more new loggers can now be allocated to it (see page 54).

Deleting a group You can delete a logger group from the Commander.

First select the particular group in the list. Then select the **Delete** button and answer the confirmation query with **Yes**.

If the loggers in this group are not contained in any other existing groups, deleting simultaneously de-registers them from the Commander. The measured data of the group is retained in the history as long as the 'History' function is active (see page 34). Otherwise the data will be lost.

7.2.2 Managing the loggers in the Commander

Select the  symbol in the main menu, and the **Logger Management** button in the next view, to go to the menu for managing loggers. The loggers of the workgroup (see page 20) are listed.

L_Seba_Demo						9 Logger
ID	Comment	Date / Time	ESA	Level	Hz	Unit
000114	LOG 007	03.02.2011 11:00	17	11	250	
000116	LOG 001	03.02.2011 11:51	5	5	50	
000117	LOG 008	07.03.2011 12:01	95	55	400	
000121	LOG 006	28.02.2011 08:21	57	43	100	
000123	LOG 004	04.03.2011 11:58	93	54	400	
000141	LOG 003	03.02.2011 10:59	2	2	50	
000178	LOG 005	03.02.2011 10:03	73	39	700	
000199	LOG 002	03.02.2011 11:52	47	28	350	
000555	text	---	---	---	---	

Add logger Change comment Replace logger Delete logger

If the incorrect group is displayed, you can use the pull-down menu at the top edge of the screen to change the workgroup.

If you do not wish to allocate a new logger to an existing but to a completely new group instead, this new group must be created beforehand (see page 52).

Registering loggers using automatic detection

A logger can be **registered using 'automatic detection'**. For this purpose, it has to be close to the Commander and switched off. Proceed as follows:

Step	Description
1	Apply the Add logger button.
2	Switch the logger on. Result: Directly after it is switched on, the logger sends a signal with its identification number a few times. Once the logger is detected by the Commander, New ID found appears on the screen. The ID of the logger is displayed underneath.
3	Select Accept to add the logger to the group or Decline to discard it.
4	If you want to number the loggers consecutively, stick the supplied self-adhesive label with the number of the automatically assigned comment on the logger (see below).
5	Use the same method to add all the other new loggers to the group. When loggers need to be switched on, always bring them close to the Commander singly. This is because only the last detected ID is shown on the screen and able to be registered.
6	Apply the Finish button to complete the procedure and to return to the logger list. Result: The new registered loggers are now shown in the list.

Registering loggers manually A logger can be **registered manually by entering its ID**. Proceed as follows:

Step	Description
1	Apply the Add logger button. Result: The screen for entering the device IDs opens.
2	Type in the logger's six-digit ID (see page 20) using the displayed keyboard. Confirm the input with the ENTER button. Result: The logger is now logged on to the relevant group. The logger ID is shown again in a field at the top right of the screen, along with the 'Comment', which was automatically assigned to the logger (see further below).
3	If you wish to number the group loggers consecutively, stick the label with the number from the automatically assigned comment onto the top of the logger.
4	If you wish to add further loggers to the group, enter the IDs one after the other and confirm each one with ENTER .
5	Click on the Finished button to complete the procedure and to return to the logger list. Result: The new registered loggers are now shown in the list.

Numbering loggers A comment is automatically left on every logger, when it is registered. The first registered logger gets the comment 'LOG001', the second one 'LOG002' and so on. This way, the loggers of a group are consecutively numbered.

Self-adhesive labels with the same numbers come supplied. Sometimes it can be helpful to put the labels, with the relevant numbers, on the loggers directly after registration. Thus, the loggers can easier be identified on-site.

Changing a comment You are able to change the automatically assigned comment of a logger in the displayed group. Proceed as follows:

Step	Description
1	Select the logger in the list to change its comment.
2	Apply the Change comment button.
3	Use the displayed keyboard to change the text and confirm the input with the ENTER button. Result: The changed comment is now shown in the list.

Exchanging loggers You are able to delete a logger in one step from the displayed group and to replace it with another logger. This may be necessary if, for example, an individual logger develops a fault and needs to be replaced with a new one. Proceed as follows:

Step	Description
1	Select the logger that needs to be replaced in the list.
2	Apply the Replace logger button
3	Enter the ID of the new logger to be put in the group. Use the displayed keyboard or the 'Automatic detection'. Result: The new logger appears in the list instead of the old one.

If the old logger is not contained in any other existing group, deleting simultaneously de-registers it from the Commander.

The measured data of the old logger is deleted within the group. However, it is retained in the history as long as the 'History' function is active (see page 34). Otherwise the data will be lost.

Deleting loggers You can delete a logger from the displayed group. Proceed as follows:

Step	Description
1	Select the logger in the list.
2	Apply the Delete button and answer the confirmation query with Yes .
	Result: The logger is no longer contained in the list.

If the logger is not contained in any other existing group, it is simultaneously de-registered from the Commander.

The measured data of the logger is deleted within the group. However, it is retained in the history as long as the 'History' function is active (see page 34).

7.3 Programming the loggers

Each logger must be configured before each measuring session. They are assigned with all the relevant parameters before the impending measurement.



Even loggers that have already been programmed and installed can usually be reprogrammed. However, to save power, all loggers in group mode 'Patrol' can only receive the Commander's signal every 10 seconds, even in the time when they are ready for wireless operation. It can therefore take a very long time to program these loggers.

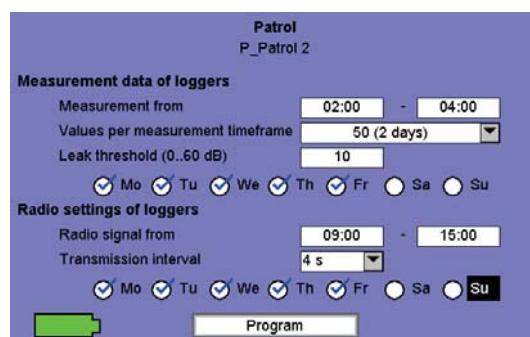
Where possible, we recommend that all the loggers are changed to configuration mode before programming, i.e. to switch them off for at least 3 minutes and then to switch them back on again. Loggers can be reliably programmed in configuration mode.

7.3.1 Accessing the configuration screen

Proceed as follows to open the configuration window for a logger:

Step	Description
1	Select the  symbol in the main menu bar.
2	In the next menu, select the Program Logger / Group button. Result: The menu for logger programming opens. The loggers in the current workgroup are listed here. If you would like to program loggers not in the workgroup, you can use the drop-down list at the very top of the screen to call up another registered logger group.
3	If you wish to program all the loggers in the displayed group, apply the Prog. Group button. If you wish to program a single logger in the group, first select the list and then choose the logger. Then apply the Prog. Single button.

Result: The input window for configuring the loggers opens on the screen.



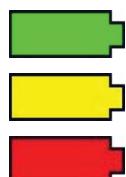
Measuring parameters The following parameters must be stated in order to define the measuring window:

Parameter	Description
Measurement (from ... to)	<p>Beginning and end of the daily measuring window. Select from: 0:00 to 24:00 hours Default: 2 a.m. to 4 a.m.</p> <p>Explanation: The logger performs measurements and saves the measurement values within the stated window. Interference from background noise (traffic, water use, etc.) should be at a minimum at this time.</p>
Values per measuring window	<p>Number of saved measured values per day. Select from: All 100 measured values or the 50/20/10/5 lowest values of the measuring window Default: 50</p> <p>Explanation: A logger performs 100 measurements in each measuring window. A maximum of 100 pairs of values (noise level and frequency) can be saved in the internal memory. The pull-down menu is used to specify whether all 100 measured values in the logger are to be saved or just the lowest 50/20/10/5 values in the period.</p> <p>If, for example, '100 pairs per measuring window' is specified, the logger must be read after each measuring day so that no measured data is overwritten in the subsequent day.</p> <p>If '20 measurement values per measuring window' is specified, the logger only has to be read after 5 measuring days.</p>
Leak threshold value	<p>Noise level from which to classify a noise as a leak. Select from: 0 to 60 dB Default: 10 dB</p> <p>Explanation: If the lowest measured noise level in a measuring period is above this threshold, this is an indication to the user that there is a leak in the pipe system. Loggers where the threshold is exceeded are pointed out in particular during the data read-out and analysis.</p> <p> Experience shows that it is often sensible to have a value of 10 dB as the leak threshold.</p> <p>In order to gain an impression of the average noise level in the pipe and to gauge whether the default leak threshold of 10 dB is too high or too low, one possibility would be to perform a real time measurement (see page 71) before programming the loggers at the place of use.</p> <p>If, during the first few measuring days, the selected leak threshold is always far too low or far too high, you should once again reprogram the loggers concerned and adjust the leak threshold.</p>
Measuring days (Mon to Sun)	<p>Days of the week when measurements are to be taken. Select from: Monday to Sunday Default: Monday to Sunday</p> <p>Explanation: No measurements are performed on the other days.</p>

Radio parameters Continuous wireless availability and frequent wireless exchange of data have a detrimental effect on the lifetime of a logger's battery. To spare the battery, the periods of wireless availability and activity can be restricted. To do this, the following parameters must be entered:

Parameter	Description
Radio signal (from ... to)	<p>Beginning and end of the daily transmission window. Select from: 0:00 to 24:00 hours Default: 9:00 to 15:00 hours (in group mode 'Patrol') or 8:00 to 17:00 hours (in group mode 'Lift&Shift') Explanation: The logger is ready to receive during this time and can be configured or read. Furthermore, when a logger is in group mode 'Patrol', it regularly transmits packets with measured data during this time.</p> <p> It is not possible to communicate with the logger outside the given transmission window.</p>
Transmission interval	<p>Transmission interval in 'Patrol' mode. Select from: 2/3/4/5/10/15 seconds Default: 4 sec. Explanation: Number of seconds after which a logger in group mode 'Patrol' repeats the transmission of the recorded measured data (during the time span entered in radio signal only!). The shorter the transmission interval, the faster a logger is detected by the reading device as it passes by. However, long transmission intervals spare the battery of the logger.</p>
Transmission days (Mon to Sun)	<p>Days of the week when the set transmission window applies. Select from: Monday to Sunday Default: Monday to Friday Explanation: It is not possible to communicate with the logger on the other days of the week.</p>

Battery symbol The colour of the battery symbol on the bottom left of the input window indicates how much the entered configuration will affect the service life of the logger's battery.



- Green ... battery lifetime not or hardly affected
- Yellow ... battery lifetime badly affected
- Red ... battery lifetime very badly affected

If the factory-set, default configuration is used, a noise logger can be operated for about 5 years without interruption. Any extension of the measuring window or transmission window reduces the battery's life accordingly.

7.3.2 Entering and transmitting configuration data

After opening the configuration screen, proceed as follows:

Step	Description
1	Enter the data in turn for the group or the single logger.
2	<p>Result: The configuration data is transferred from the Commander to the group.</p> <p>A new view opens on the screen with two windows:</p> <p>The left-hand window shows the loggers in the group that have been successfully programmed.</p> <p>The right-hand window shows the loggers that have yet to be programmed.</p> <p>The antenna symbol indicates that the Commander is wirelessly operational.</p> <p>The Stop and Start buttons can be used to cancel and continue the procedure at any time.</p> <p>Data transfer ends automatically once all the loggers in the group have been successfully programmed.</p> <p>If a logger could not be programmed, it may have been switched off, not ready for wireless operation or it was outside the Commander's wireless range.</p>



From now on, do not place the loggers on their head because switching off would cause them to lose their configuration data and they would need to be reprogrammed.

The loggers are now ready to be installed for use on location.

7.4 Installing the loggers

You can find detailed information on installing the loggers in a special section of the Logger chapter (see page 24).

7.5 Reading out the measured data

After a group has been installed for at least one measuring day, the recorded data can be called up with the Commander.

In the Commander, the group to be read out has to be selected as workgroup (see page 20).

Furthermore, you can always read just a single logger instead of a group.

7.5.1 Quick query of the workgroup

The button on the very left of the main menu bar is always used as a quick-start button for reading the workgroup. Depending on the workgroup's group mode, the quick-start symbol is as follows:



Starts reading a
'Lift&Shift' group



Starts
'Patrol'



Starts reading data of a
'Network' group
from the GSM-Box

Make sure a wireless connection with the loggers or the GSM-Box can be established.

When this button is applied, reading immediately begins for the current workgroup. The following view opens:



The antenna symbol indicates that the Commander is wirelessly operational. The left-hand window shows the loggers in the group that have been successfully read. The right-hand window contains all the loggers that have yet to be reached.

Reading finishes automatically once the Commander has received and saved the measured data from all the loggers in the group.

If a logger cannot be read, it may be switched off, not ready for wireless operation or it may be outside the Commander's wireless range.



'Patrolling' in the Professional mode does hardly differ from 'Patrolling' in the Easy mode. For further information, please refer to the corresponding section in the Easy mode chapter (see page 45).

All information about reading out a 'Network' group can be found in the network chapter (see page 92).

7.5.2 Standard query of a single logger

If you only wish to read a single logger with the commander, proceed as follows:

Step	Description
1	Select the  symbol in the main menu bar.
2	In the next menu, select the Read measurement data button. Result: The loggers in the workgroup are listed in the next view.
3	If necessary, call up another logger group using the drop-down list at the very top of the screen.
4	Select the concerning logger in the list. Then apply the Read Single button. Result: The identification number and name of the logger are shown in the next view.
5	Apply the Read button. Result: The Commander and logger are connected and the measured data is transferred. A blue bar shows the progress of the data transfer. After the transfer has been successfully completed, the display automatically switches to the menu for showing the measured data (see page 48). An error message appears if the data transfer fails. Ensure the Commander is in the wireless range of the logger/group/GSM-Box concerned. The logger must be ready for wireless operation. Press Read again to repeat the procedure.

7.5.3 Standard query of a 'Lift&Shift' group

A 'Lift&Shift' group can not only be read using the quick-start button, but also by proceeding as follows:

Step	Description
1	Select the  symbol in the main menu bar.
2	In the next menu, select the Read measurement data button. Result: The loggers in the workgroup are listed in the next view.
3	If necessary, call up the group concerned using the drop-down list at the very top of the screen.
4	Apply the Read Group button. Result: The Commander and logger/GSM-Box are connected and the measured data is transferred. The same view opens on the screen as with the 'Quick query'.

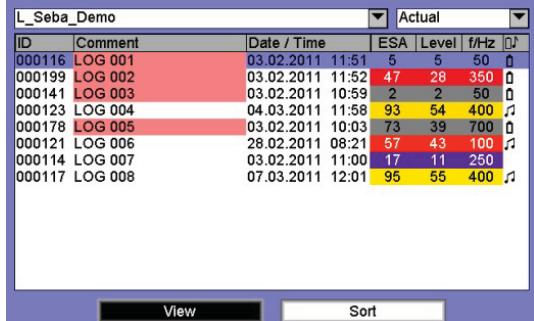


It is not possible to read a 'Patrol' group or a 'Network' group using this method. For them, please use the 'Quick query' (see page 61).

7.6 Evaluating the measured data

7.6.1 Calling up the measured values

Calling up recent measured data To view the measured values from a logger on the Commander's screen, proceed as follows:

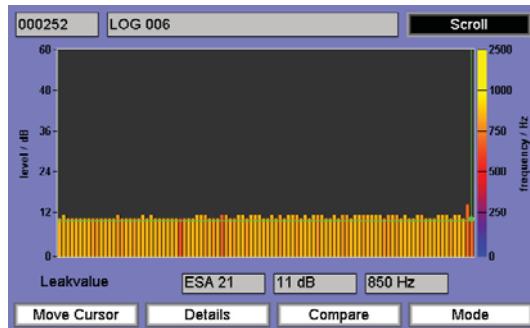
Step	Description
1	Select the  symbol in the main menu.
2	In the next menu, select the Display logger data button. Result: The loggers in the workgroup are listed in the next view: 
Result: The loggers in the workgroup are listed in the next view:	
3	If necessary, you can call up a different group using the drop-down list at the very top of the screen.
4	Use the View button to call up the measured data of the highlighted logger. To call up the data of another logger in the list, select the list and then the logger. Result: The measured data is shown.

Calling up older measured data If the History function has been activated in the Commander's system settings (see page 34), you are not only able to access recent data read from the logger but also older sets of data.

To do so, in Step 2 select the **Actual** line at the top right of the screen and then, from the drop-down list, the date of the data set that you wish to view. The date refers to the day of the read-out. If there is only one data set available for the respective date, it is shown immediately. Otherwise, select the desired logger from the displayed list.

7.6.2 Displaying the measured values

Displaying measured data The measured data from the loggers is shown as a bar diagram on the screen just as described in the Easy mode chapter (see page 48).



Comparing measured data Additionally, the Professional mode provides the opportunity to compare the displayed data with the data of another logger of the group or with an older data set. To do so, proceed as follows:

Step	Description
1	<p>Select the Compare button.</p> <p>Result: The list of loggers in the workgroup opens on the screen.</p>
2	<p>If you want to call up the actual data set of another logger for comparison, select the table and choose the logger.</p> <p>If you want to call up an older data set for comparison, select the Actual line at the top right of the screen and then, from the drop-down list, the date and, if necessary, the logger of the desired data set.</p> <p>Result: The following view appears on the screen:</p>
	<p>The two diagrams show the two data sets graphically. The values of the logger selected first are above, the values of the logger for comparison below.</p> <p>The leak value (ESA / noise level / frequency) of the first and second logger are shown numerically under the diagrams.</p> <p>After applying the Move Cursor button, you can move the vertical green line in the diagrams to view the values of the individual recordings in greater detail.</p> <p>You can use the Mode button (see page 49) to change the measurement unit on the Y-axis in the diagram.</p> <p>To choose another data set for comparison, use the arrow key to return to the logger list and select a different logger from the table or from the Actual drop-down list.</p>

(continued on the next page)

Step	Description
	<p>i Be aware that the two sets of measured data appearing opposite each other may be based on different measuring periods – depending on the programming of the logger at the time of measurement.</p>

7.6.3 Advanced Analysis

Introduction This function displays whether the likelihood of a leak for each logger in the group is to be judged as **high**, **medium** or **low** for the logger in question.

To do so, the function evaluates the measured logger level and frequency values, places them then in relation to each other and compares them against the given threshold values.

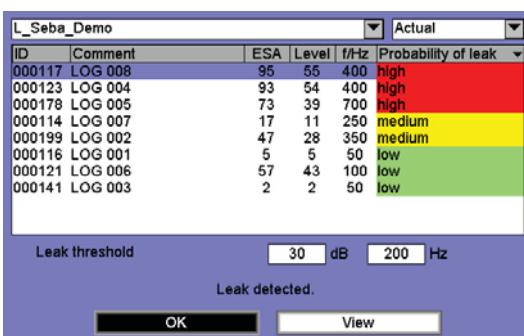
The underlying threshold values for level and frequency are displayed below the logger list in two fields.

You can change these two values and by doing so you can recalculate the probability of a leak.

Setting a new threshold value for the noise level may be useful, for example if - after the measurement - it becomes apparent that the leak threshold selected when the logger was programmed was impractical.

Setting a threshold value for the noise frequency enables low frequency ranges to be hidden from view when estimating the likelihood of a leak.

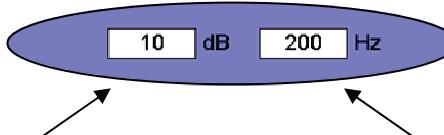
Procedure Proceed as follows to use the Advanced Analysis:

Step	Description
1	Select the  symbol in the main menu.
2	In the next menu select the Advanced analysis button.
<p>Result: The loggers in the workgroup are listed in the next view. The logger's leak probability is shown at the far right of the table.</p>  <p>The screenshot shows a software interface titled 'L_Seba_Demo'. It displays a table of logger data with columns: ID, Comment, ESA, Level, f/Hz, and Probability of leak. The 'Probability of leak' column uses a color-coded legend: red for high, yellow for medium, and green for low. Below the table, there are input fields for 'Leak threshold' (30 dB) and 'Leak detected' (200 Hz), and buttons for 'OK' and 'View'.</p>	

You can select another logger group if you wish using the drop-down list.

The drop-down list at the top right can be used to call up measurement data from previous measurements.

(continued on the next page)

Step	Description
3	To change the threshold value for the level and/or frequency, select the respective input box and enter the required value.  <p>Level threshold Adjustable from 0 - 60 dB</p> <p>Frequency threshold Adjustable from 0 - 1000 Hz (in steps of 50 Hz each)</p>
Result: Immediately after entering the values, the estimate of a leak probability for each logger is updated and displayed again.	

Displaying measurement data If you wish to display the measurement data for a logger, select the logger in question in the list and then click on **View**. The screen changes to the menu for displaying measurement data (see page 48).

You can end the Advanced Analysis by clicking on **OK**.

8 Additional measuring functions

8.1 Saving and locating the GPS position (in Professional mode only)

Introduction Using a GPS module, available as an optional extra, as an aid, you can determine the GPS coordinates of a logger at the same time as you install it and save the installation location in the commander.

These GPS data can, on the one hand, help to find the exact installation location of the logger in the area of operation later on.

On the other hand, the SebaDataView-3 software can be used as an aid to record the position of the logger on a map on the PC.

Requirements To save GPS coordinates using the commander, or to find them again, the GPS module must be connected.

The GPS module is connected with the commander using the USB port **10**. When connecting, observe the markings on the plug and socket. You must feel the plug engage.

The GPS module is powered via the USB connection. The device switches on immediately after connection and is ready for operation. The status LED lights up blue. The device is detected automatically by the commander. Further settings are not required.

8.1.1 Determining and saving GPS coordinates

To determine the GPS position for a logger, you must take the commander and proceed as close as possible to the installed logger.

Proceed as follows:

Step	Description
1	Select the  symbol in the main menu.
2	In the next menu, select the Store GPS Position button. Result: In the next view, the loggers in the workgroup will be listed with the GPS positions saved to date.
3	If necessary, you can select a different logger group by using the drop-down list at the top edge of the screen.
4	Select the list and select the logger, for which the GPS position is to be determined, from the group.

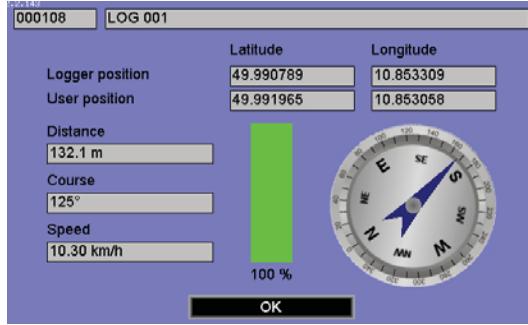
(continued on the next page)

Step	Description
5	<p>Select the Store GPS Pos button.</p> <p>Result: The menu for determining the GPS position opens. The ID and the comment for the logger, for which the position is to be determined, are displayed again. The GPS module will search for available satellites.</p>
	
6	<p>After a while, the current GPS time is displayed.</p> <p>As soon as the position of the commander can be calculated, the current latitude and longitude are specified.</p> <p>By pressing the GPS format button repeatedly, you can switch between the following three formats for displaying the GPS position:</p> <ul style="list-style-type: none"> • Decimal degrees • Degrees, minutes • Degrees, minutes, seconds <p>The vertical green bar at the right of the screen indicates how high the accuracy is with which the position can currently be determined.</p> <p>Info: The first time the current position is determined after connecting the GPS module may take a little time. The commander should not be moved during this phase. It is best to put it down somewhere.</p> <p>Select the Store button.</p> <p>Result: The menu for determining the GPS position closes. The display returns to the list of loggers in the workgroup. The GPS position of the logger which has just been determined now appears in the list.</p>

8.1.2 Navigating to a GPS position

The commander features a navigation function which can help you to find the position of a logger, for which you have saved the GPS coordinates, in the area of operation.

Proceed as follows:

Step	Description
1	In the main menu of the commander, select the symbol  .
2	In the next menu, select the Store GPS Position button. Result: In the next view, the loggers in the workgroup will be listed with the GPS positions saved to date.
3	If necessary, you can select a different logger group by using the drop-down list at the top edge of the screen.
4	Select the list and select the logger from the group which should be located.
5	Select the Navigate button. Result: The navigation function view opens on the screen. 
6	At the top of the screen the ID and the comment for the logger concerned are displayed. Underneath this, the GPS coordinates of the logger as well as its location can be found. The direct distance to the logger is also shown, in metres. The stylised compass indicates the direction in which the logger can be found based on your location. If the red compass needle points on the display points to the right, for example, then the logger you are looking for is to the right of you. If it points to the left, then the logger is to the left of you, etc. The vertical green bar in the middle of the screen indicates how high the accuracy is with which the position of the commander (i.e. your location) can currently be determined. You can end the navigation function using OK .

8.1.3 Deleting GPS coordinates

Deleting the GPS coordinates of a logger You can delete the save GPS position of an individual logger in the commander.

Proceed as follows:

Step	Description
1	Select the  symbol in the main menu.
2	In the next menu, select the Store GPS Position button. Result: In the next view, the loggers in the workgroup will be listed with the GPS positions saved to date.
3	If necessary, you can select a different logger group by using the drop-down list at the top edge of the screen.
4	Select the list and select the logger from the group, for which the GPS data is to be deleted.
5	Press the Delete GPS Pos button.
6	Answer the security query with Yes . Result: The GPS coordinates of the logger have been deleted.

Deleting the GPS coordinates of a group You can delete the saved GPS coordinates of all loggers in a group from the commander. The logger group concerned must be registered as a workgroup (see page 20) in the commander to do so.

Proceed as follows:

Step	Description
1	Select the  symbol in the main menu.
2	In the next menu, select the Reset/Delete logger data button.
3	In the next menu, select the Delete GPS data button. Result: The name of the logger group concerned is displayed again.
4	Answer the security query with Yes . Result: All saved GPS positions for this group are deleted from the memory of the commander.

8.2 Real time measurement

Introduction The 'Real time measurement' function allows you to follow, in real time, the current noise level and the frequency in a pipe directly on location and without additional measuring devices. A logger measures continuously and immediately transfers the data to the Commander.

Purpose The real time measurement can be useful in many situations. Here are some examples:

- Before a measurement session, you can use the real time measurement to gain a first impression of the noises in the section of pipe concerned. This enables you, for example, to estimate a sensible leak threshold for the measurement.
- With real time measurements at various points on the pipe network, you can already distinguish during the day the non-critical pipe sections from the potentially critical ones. They can then be examined more closely using a night measurement. If the pipe noise in a section is already very low during the day, the probability of a leak is not very high. A night measurement may then no longer be necessary at this position and the logger can be used at a more critical point in the pipe network.
- When 'patrolling', you can use a real time measurement to check the results there and then from the loggers indicating a high leak probability.

Requirements The logger used for the real time measurement must be switched on and ready for wireless operation. You can install a logger in configuration mode (see page 20) at a position on the pipe or use a logger already installed for the function. The logger does not have to be programmed for the function!

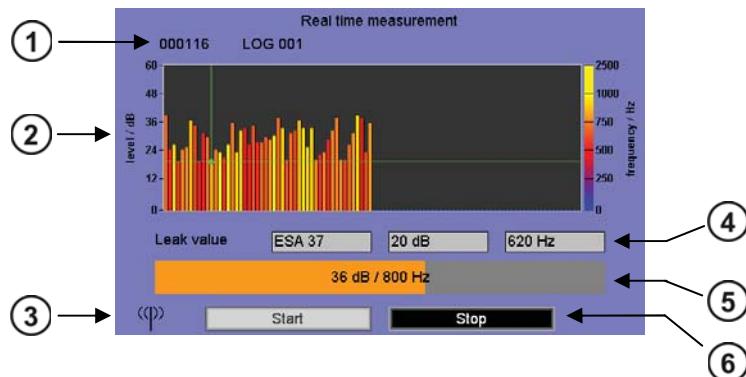
Procedure in Easy mode In Easy mode, proceed as follows to perform the real time measurement:

Step	Description
1	In the main menu, select the Real time measurement  button. Result: The loggers in the workgroup are listed in the next view.
2	Select the list and there select the logger that you wish to observe. Result: Observation of the logger begins. The view for the real time measurement appears on the screen (see further down in the text).

Procedure in Professional mode In Professional mode, proceed as follows to perform the real time measurement:

Step	Description
1	Select the  symbol in the main menu.
2	In the next menu, select the Real time measurement button. Result: The loggers in the workgroup are listed in the next view.
3	If necessary, you can call up another group using the drop-down list at the very top of the screen.
4	Select the list and there select the logger that you wish to observe. Result: Observation of the logger begins. The view for the real time measurement appears on the screen (see further down in the text).

Display of measured data The course of the real time measurement is shown on the Commander's screen with a running bar diagram:



Element	Description
(1)	Identification number and comment of the observed logger
(2)	Diagram X-axis ... course of measurement over time Y-axis ... noise level in dB Each bar represents a single noise recording. The colour of the bar shows the approximate frequency of the noise:  The point where the two green lines intersect marks the quietest recording in the displayed measurement, the so-called 'leak value'.
(3)	Antenna symbol indicates that the Commander is wirelessly operational
(4)	Minimum value of the display (leak value) Left-hand field ... ESA value of the quietest recording Centre field ... Noise level of the quietest recording (in dB) Right-hand field ... Frequency of the quietest recording (in Hz)
(5)	Current value of the display Noise level (bar height) and frequency (bar colour) of the current measuring value (including numeric values).
(6)	Buttons Stop and Start can be used to cancel and continue the observation at any time. However, the time gap between cancellation and continuation is not shown.

Use the ESC button (7) to end the function and return to the main menu.



The permanent wireless connection during the real time measurement requires a lot of power. This has a detrimental effect on the lifetime of the logger's battery. Please consider this when using the function.

8.3 Audio recordings

Loggers in the Sebalog N-3 series are able to save recorded noises as audio files and to send them to the reading device. This means the user is no longer reliant on the measurement values alone (level/frequency/ESA value) when evaluating a noise. You can actually listen to the suspected leak.

Firstly, the loggers automatically save the quietest noise in the measuring period as an audio file. This file can, for example, be called up later with the Commander and replayed.

Secondly, you can get a recording of the current noise in the pipe from each installed logger. This allows you to listen on a pipe, almost in real time, without any additional equipment (sensor rod microphone or similar).

8.3.1 Reading out the audio data

Introduction Each logger automatically records the quietest noise (leak noise) in a measuring period and saves it as an audio file. To spare the logger's battery, this file is not automatically sent to the reading device when the logger is read. It must be queried separately.

Procedure To query audio data in a logger, proceed as follows:

Step	Description	
1	In Easy mode select the  button in the main menu.	In Professional mode select the  symbol in the main menu bar.
2	Select the Read / Play audio data button.	Select the Read audio data button.
Result: The loggers in the workgroup are listed in the next view.		
3		If necessary, you can call up another group using the drop-down list at the very top of the screen.
4	Select the logger list and then the logger from which you wish to call up the leak noise.	
5	Apply the Read audio data button to continue.	Result: The ID and comment of the logger, from which the audio data is called up, are shown once again in the next view.
6	Apply the Start button to start the data transfer.	Result: A blue bar shows the progress of the transfer. After the transfer has been successfully completed, the display automatically switches to the menu for playing back audio data (see page 74). You can then listen to the leak noise that has just been read. An error message appears on the screen if the data transfer fails. Make sure that the two devices are both within transmission range of each other. Press Start to repeat the procedure.

8.3.2 Playing back the audio data

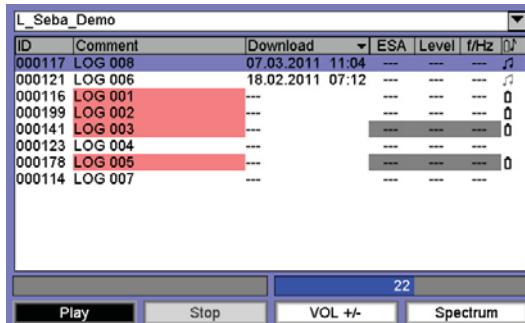
Introduction After an audio file is sent from a logger to the Commander, it can be played back with the Commander and listed to over headphones.

First, connect the supplied headphones to the Commander via the 5-pin headphone socket **10**. White markings on the plug and socket show the correct position of the plug. You must feel the plug engage.

Procedure To play back an audio file, proceed as follows:

Step	Description	
1	In Easy mode ...	In Professional mode ...
	... apply the  button in the main menu of the Commander.	... select the  symbol in the main menu bar of the Commander.
2	Select Read / Play audio data once again in the next view.	Apply the Play audio data button in the next view.
3	Apply the Play button.	If necessary, you can call up another group using the drop-down list at the very top of the screen.

Result: The menu for playing back audio files opens.



In the column at the far right, a note symbol informs you whether audio data for the respective logger have been saved in the commander:

- A black note symbol  indicates the respective logger from which the current audio data are saved in the commander. That means, the last measured data read out and the available audio data originate from the same measuring period.
- A grey note symbol  indicates the respective logger from which only older audio data have been saved in the commander. That means the available audio data is older than the last measuring data read out. In the **Download** column, the time at which the audio data were called up from the logger is displayed.

Loggers which are not labelled with a note symbol do not have any audio data saved in the commander.

4 Select the logger list and then the logger from which you wish to play back the audio data.

(continued on the next page)

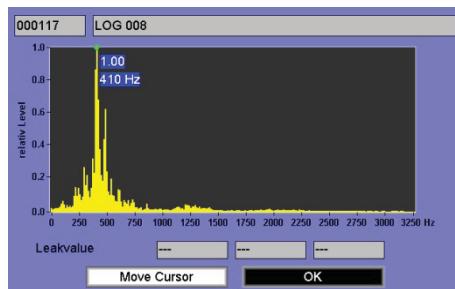
Step	Description
5	<p>Apply the Play button.</p> <p>Result: The three-second recording of the leak noise is played back and continuously repeated.</p> <p>The yellow bar indicates the playback.</p> <p>You can adjust the headphone volume. To do so, apply the VOL +/- button and turn the selector knob. The blue bar above the button shows the current setting.</p>
	<p> Before playing an audio file, it is advisable to first have the headphone volume on a medium setting (e.g. level 18).</p>
	<p>In Professional mode the frequency range of the recorded noise can be displayed using the Spectrum button (see page 76).</p> <p>Playback can be ended at any time with the Stop button.</p>

8.3.3 Displaying the frequency spectrum of the leak noise (in Professional mode only)

Introduction In Professional mode, you can view the frequency spectrum of the saved leak noise for an even more in-depth analysis.

Purpose Sometimes the assumed leak noise stems from a known source of interference (e.g. 50 Hz/100 Hz mains voltage or a pump in operation). However, you should not prematurely believe the conspicuous noise to be non-critical because there could still be a real leak noise next to the background noise. By analysing the frequency spectrum, you can check the saved noise for frequency peaks other than those of the interference.

Procedure Apply the **Spectrum** button in the menu for playing back audio files (see page 74). The following view opens on the screen:



The diagram shows the spectrum of frequencies producing the saved leak noise (0 to about 3,250 Hz).

X-axis ... Frequency spectrum of the leak noise

Y-axis ... The most dominant frequency of the noise corresponds to '1' on the dimensionless scale. All the other frequencies occurring are shown in relation to this.

You can move the vertical green line in the diagram in order to view in greater detail the frequencies at individual points on the curve. To do so, apply the **Move Cursor** button and turn the selector knob.

Close the view with the **OK** button and return to the menu for playing back audio files.



The recorded frequency spectrum of a noise is influenced by many factors (position of the logger, logger's contact with the pipe, reflections in the pipe, etc.). Even small changes in these factors can considerably change the displayed frequency spectrum of the same noise. The inexperienced user can quickly make misjudgements. Therefore, the frequency spectrum analysis should above all be performed by experienced users who, for example, know how to use correlators. Sometimes the frequency shown under 'leak value' can diverge slightly from the maximum frequency in the diagram display. This is not an error. This is caused by the finer graduation of the displayed frequency band in the Commander, compared to the internal graduation in the loggers. The value shown in the diagram is therefore somewhat more precise.

8.3.4 Recording a noise directly (in Professional mode only)

Introduction The 'Direct recording' function of a Log N-3 logger enables you to listen in on the current noise in a pipe without using additional equipment (sensor rod microphone or similar).

If 'Direct recording' is performed with a logger already installed, you do not even have to open the shaft to listen to the pipe.

With this function, the logger creates a three-second recording of the current noise in the pipe. This audio file is then immediately sent to the Commander where it can be replayed. The pipe noise can thus be tracked almost in real time.

Requirements You can perform 'Direct recording' with any logger already installed, if it is programmed in 'Lift&Shift' or 'Patrol' group mode

However, you can also use a logger that has not been installed yet. The logger does not have to be programmed after being switched on. It can simply remain in configuration mode (see page 20) instead.

Unfortunately, the system will not allow loggers in 'Network' group mode to be used for this function.

To record a noise directly, a logger must be switched on, within its programmed 'Wireless ON' time, installed on the pipe and located within the wireless range of the Commander. The distance is preferably between 1 and 10 m.

Procedure Proceed as follows to record the pipe noise directly:

Step	Description
1	Select the  symbol in the main menu and the Direct recording button in the next view. Result: The loggers in the workgroup are listed in the next view.
2	If necessary, you can call up another logger group using the drop-down list at the very top of the screen.
3	Select the table and then the logger for recording the current noise.
4	Apply the Start recording button. Result: The ID and comment of the logger to perform the recording are shown once again in the next view. The Commander and the logger are connected. The noise recording and following transfer of the audio file to the Commander take place automatically. A bar shows the progress. After the data has been transferred successfully, the menu for playing back audio files (see page 74) opens automatically on the Commander's screen.

8.3.5 Deleting audio data from the commander

You can delete the saved audio data of all loggers in a group from the commander. The logger group concerned must be registered as a workgroup (see page 20) in the commander to do so.

Proceed as follows:

Step	Description
1	Select the  symbol in the main menu.
2	In the next menu, select the Reset/Delete logger data button.
3	In the next menu, select the Delete audio data button. Result: The name of the logger group concerned is displayed again.
4	Answer the security query with Yes . Result: All saved audio data for this group are deleted from the memory of the commander.

8.4 Exporting the programming from a Log N-3 device (in Professional mode only)

Introduction Using the commander as an aid, you have the option of exporting the current configuration from a Log N-3 device.

Requirements The commander must be operated in Professional mode. The device concerned must be switched on and ready for transmission, and it must be within the transmission range of the commander.

Procedure Proceed as follows:

Step	Description		
1	Select the  symbol in the main menu.		
2	In the next menu, select the Read device configuration button.		
3	In the next menu, select the device type from which you wish to export the configuration data:		
4	Logger The loggers in the workgroup appear in a list. If necessary, select another group from the drop-down list.	Repeater In the next view, enter the ID of the repeater whose configuration should be exported. Use the number field and confirm using ENTER , or use the 'Automatic detection' and confirm using Accept and Finish (see page 30).	GSM box The ID and comment of the GSM box for the current workgroup are displayed. If necessary, select another group from the drop-down list.
5	Select the logger whose configuration should be exported.		Select the Read config button.
<p>Result: The identification number of the device is displayed. A connection is established and the configuration data are transmitted to the commander. A bar indicates the progress.</p> <p>After successful transmission, the configuration data exported from the device are displayed. Using the Next and Previous buttons, you can scroll through the individual display pages.</p>			

8.5 Saving and invoking pictures

Introduction You can save picture files in the Commander and show the pictures on the screen. This can refer here to sections of a map or photos of the installation locations for the logger etc. This may be of some help to you if you wish to relocate installed devices on site.

Requirements The following requirements must be met:

- File format: JPG
- File size: max. 1MB
- Optimum resolution: 640 x 396 pixels
- A destination folder named '_PICS' is created in the Commander's main directory

Save picture To save a picture file in the Commander, proceed as follows:

Step	Description
1	Establish a USB cable connection between the Commander and the computer (see page 32). Result: The Commander is automatically detected as a mass storage device.
2	Check whether the main directory of the Commander contains a folder named '_PICS'. If this is not the case, create a folder with this name.
3	Copy the required picture file from the computer to the Commander and save it there in the '_PICS' folder.

Viewing picture To invoke a picture on the Commander, in the main menu select the  symbol and then **Show picture**. The first of the saved pictures is then displayed.

The two arrow keys   at the bottom right of the screen can be used to scroll between the saved pictures.

Deleting picture To delete a picture, connect the Commander to the computer again and delete the picture in question from the '_PICS' folder.

8.6 Deleting measured data

8.6.1 Deleting current measured data

You can delete the last measured data read out from all loggers in a group. The logger group concerned must be registered as a workgroup (see page 20) in the commander to do so.

Proceed as follows:

Step	Description
1	Select the  symbol in the main menu.
2	In the next menu, select the Reset/Delete logger data button.
3	In the next menu, select the Reset received loggers button. Result: The name of the logger group concerned is displayed again.
4	Answer the security query with Yes . Result: The last measured data for this group is deleted from the memory of the commander.

8.6.2 Deleting historical measured data

If the 'History' function is activated in the system settings of the commander, then along with the current measured data from the logger, data from older measurements are also stored in the commander memory.

You can delete the 'historical measured data' of the loggers in a group. The logger group concerned must be registered as a workgroup (see page 20) in the commander to do so.

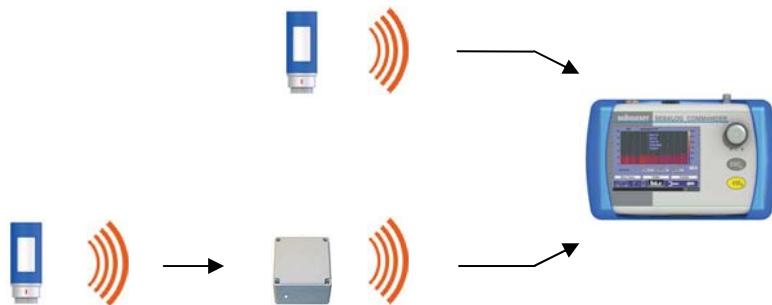
Proceed as follows:

Step	Description
1	Select the  symbol in the main menu.
2	In the next menu, select the Reset/Delete logger data button.
3	In the next menu, select the Delete history button. Result: The name of the logger group concerned is displayed again.
4	Answer the security query with Yes . Result: The 'historical measured data' for this group is deleted from the memory of the commander.

9 Increasing a logger's wireless range (in Professional mode only)

Introduction By means of the Seabalog Repeaters you have the chance to increase a logger's wireless range for 'Patrolling'.

The actual wireless range of a noise logger depends on the conditions at the place of use. If a logger is installed in a shaft, its radio signal sometimes does not reach far enough above the surface to be received properly during 'patrolling'. In such cases a repeater can be used. The repeater passes on the logger's radio signal, therefore extending the wireless link.

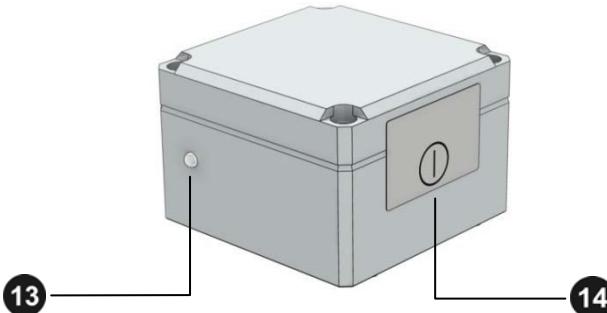


In principle, any repeater can work with any Log N-3 noise logger. However, a repeater in 'Patrol' group mode **can only ever pass on the signal of a single logger**.

Requirements The particular logger must be 'paired up' with the repeater before the measurement. The logger must already have been programmed beforehand (group mode: 'Patrol'). The logger should already be installed at the place of use.

9.1 Repeater design

Design A repeater has the following features:



Element	Description
13	Status LED Flashes blue ... ready to receive Lights up blue ... receiving data Flashes red ... transmitting data Lights up yellow then red ... switching off Lights up red then quickly flashes blue ... update is being installed No light ... switched off
14	On/Off contact field ①

Switching on/off The repeater is switched on using a magnetic switch.

Move the supplied magnet over the On/Off contact field 14 of the repeater. The Status LED 13 first lights up red; after the magnet is removed it flashes green three times. Regular blue flashing then indicates that the repeater is switched on and ready to receive.

To switch off the repeater, keep the magnet at the On/Off contact field for a few seconds. The LED first lights up yellow. As soon as it lights up red, you can remove the magnet. The repeater then switches off and the LED goes out.

Power supply Each repeater has an internal lithium battery. It can power the device for up to five years. The actual battery lifetime depends on the wireless settings of the 'paired' loggers.

When you query a repeater's configuration (see page 79), its battery status is also shown.

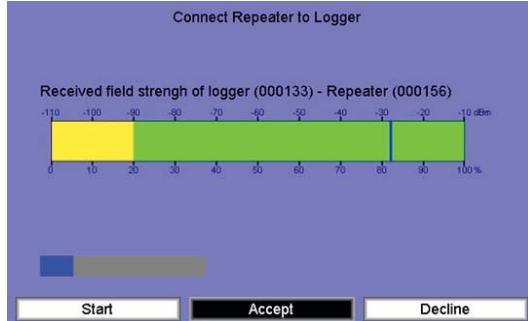
Flat batteries cannot be recharged. They must be replaced.

 CAUTION	The validity of the guarantee and warranty for the device only remains unaffected if the change of battery is carried out by SebaKMT or an authorised service partner.
---	--

9.2 Installing the wireless extension

Before the wireless extension via repeaters can be set up, the logger concerned must already be programmed and installed at its place of use.

Proceed on location as follows:

Step	Description	
1	<p>Select the  symbol in the main menu and the Connect Repeater to Logger button in the next view.</p> <p>If this button is not shown, the current workgroup is probably not a 'Patrol' group. In this case you must first specify the right 'Patrol' group as workgroup (see page 51).</p> <p>Result: The loggers in the workgroup are listed.</p>	
2	<p>If necessary, you can call up another logger group using the drop-down list at the very top of the screen.</p>	
3	<p>Select the logger list and then the logger to be connected to the repeater. If the respective reader is already preset, apply the Select Repeater button.</p> <p>Result: A window for registering the repeater in the Commander automatically opens on the screen.</p>	
4	<p>Use one of these two methods to register the repeater:</p> <p>Automatic detection: Move the switched off repeater close to the Commander and switch it on. Once the repeater is detected, New ID found appears on the screen. The ID of the repeater is displayed underneath. Use the Accept button to confirm.</p> <p>Manual input: Enter the repeater's six-digit ID with the virtual keyboard. Use the ENTER button to confirm.</p> <p>Result: The following display opens on the screen:</p>	
 <p>This display can be used to test the quality of the wireless connection between the logger and repeater and to find a suitable location for the repeater.</p>		
5	<p>Apply the Start button.</p> <p>The logger and repeater are connected.</p> <p>The vertical blue line (pointer) in the bar indicator shows the strength currently of the wireless connection between the logger and repeater.</p> <p>Green area ... Excellent connection Yellow area ... Good to satisfactory connection</p>	

(continued on the next page)

Step	Description
	<p>For a stable connection, the pointer should clearly remain in the green area. The number of wireless 'packets' which have been successfully exchanged by the two devices is shown below the signal strength display. There should be at least 15 - 25 packets received without any interruption.</p> <p>If a large number of 'lost packets' are consistently displayed, then the connection is not satisfactory.</p> <p>If the dual test does not start and an error message appears, then both devices are outside the transmission range of the commander. Move into the wireless range of one of the devices.</p>
	<p> Proceed carefully and take enough time when performing a Dualtest. If the test indicates no sufficiently good connection, position one of the devices new until the connection can be clearly considered stable.</p>
6	<p>Look for a suitable place around the installed logger for fitting the repeater. When doing so, keep an eye on the signal strength indicator on the Commander, or watch the status LED 11 on the repeater:</p> <ul style="list-style-type: none"> LED lights up green ... Excellent connection LED lights up yellow ... Good to satisfactory connection LED flashes blue ... Inadequate connection to no connection
7	<p>When you have found a suitable position for the repeater, apply the Accept button on the Commander.</p> <p>Result: The logger and repeater are now 'paired' with each other. Any communication with the logger now automatically takes place via the repeater. This is the case until the repeater is switched back off.</p>

Installation notes When installing the repeater, you should observe the following:

- The wireless signal between the logger and repeater should be as strong as possible (green); if the connection is poor (yellow) interference can easily occur, causing the read-out to fail.
- The place of installation should be somewhat elevated, e.g. at a height of at least 3 m on a lamp post, or similar.
- The repeater should not be too easily accessible, to prevent theft or vandalism.
- The repeater must not be a nuisance to anyone or infringe any property laws.
- While measurement takes place, no impairment of the wireless connection should be expected due to external influences.

You can, for example, attach the repeater to a street lamp, house wall or, if necessary, to a tree. To do so, use the supplied cable ties, for example, or any other form of fastening that does not cause damage.

10 Installing a network (in Professional mode only)

10.1 General information

10.1.1 Introduction

Up to 50 loggers in the N-3 system can be pooled to form a network. Regular measurements allow a large area of the pipe network to be continuously monitored.

The loggers are affixed to key points in the pipe network. A 'GSM box' is installed in the middle of the network. It functions as network nodes between the loggers, and as an interface to the mobile communication network, or to the 'commander'. The measurements are queried by the loggers after every measuring period using short range radio, and saved in the GSM box. The querying follows a fixed chronological routine (see page 123). The data are subsequently transmitted to an FTP server using mobile communication, from where they can be downloaded onto any internet-capable PC. Using a PC, the users can keep themselves informed of the condition of the zone being monitored, without having to be on site – for example, every morning in the office.

Furthermore, the user can receive messages with the results of the last measurement as an SMS or e-mail.

10.1.2 Structure of a network

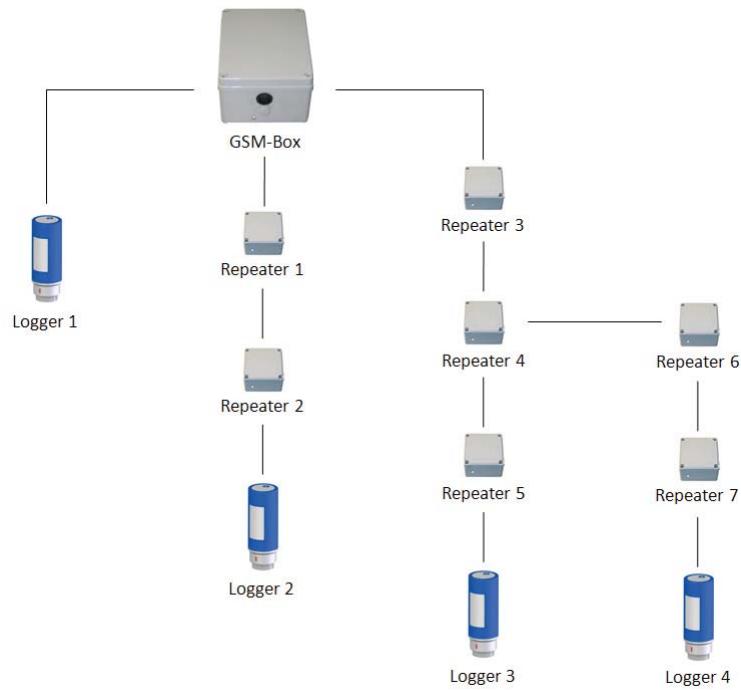
A network group is always comprised of a GSM box and a number of loggers - up to 50, depending on the size of the zone for monitoring.

Each individual logger is connected to the GSM box via short range radio. If the distance between the logger and the GSM box is too large for a direct connection, then 'repeaters' can be used to extend the radio signal. The wireless range between a logger and the GSM box is referred to as the 'communication path' in the following.

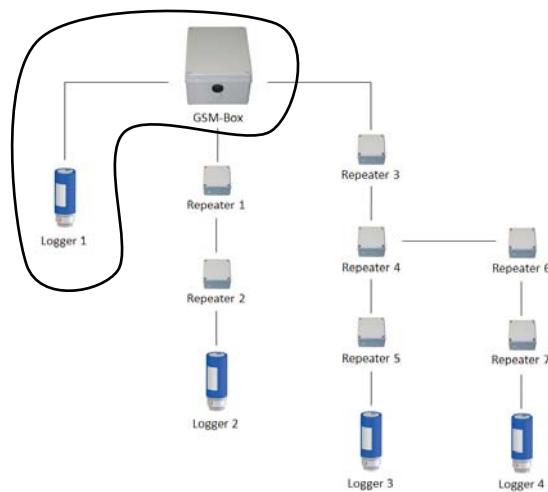
One path can be comprised of a maximum of 10 repeaters.

A repeater can administer a maximum of 10 paths.

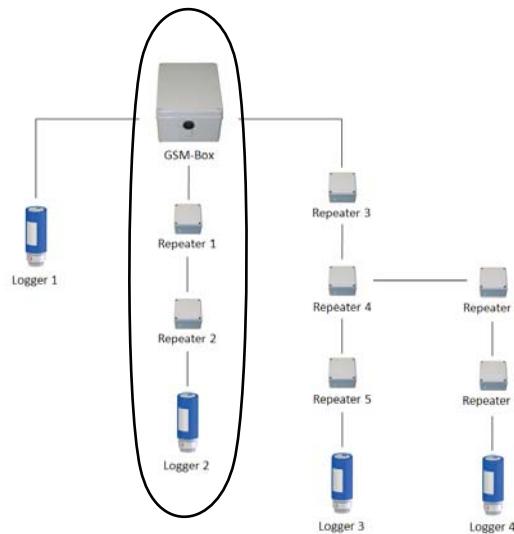
Example: The following diagram shows an example of a network with 4 paths.



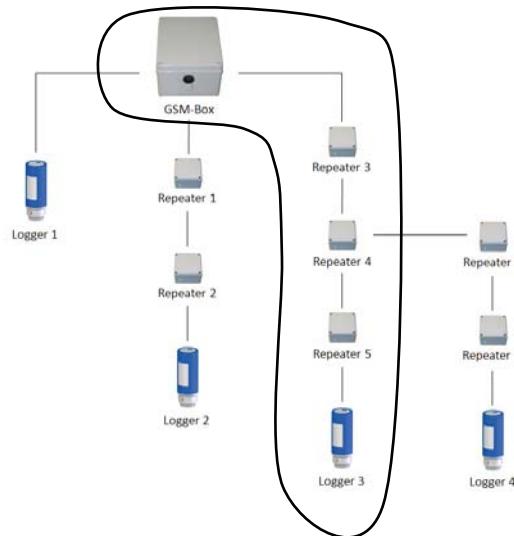
Path 1:



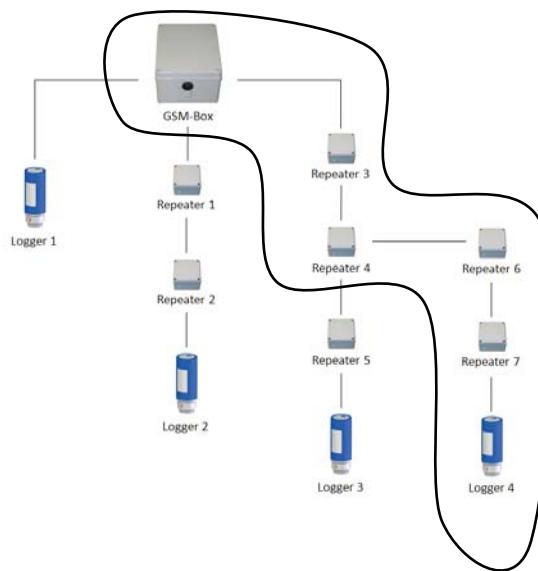
Communication path 1 is comprised of a direct wireless connection between the logger and the GSM box.

Path 2:

In communication path 2, the wireless connection from the logger to the GSM box is extended by repeaters 1 and 2.

Path 3:

In communication path 3, the wireless connection from the logger to the GSM box is extended by repeaters 3, 4 and 5.

Path 4:

In communication path 4, the wireless connection from the logger to the GSM box is extended by repeaters 3, 4, 6 and 7.

This means that repeaters 3 and 4 are each incorporated into two communication paths!

10.1.3 Mobile communication and FTP server

The network logger's measurement data are collated on a daily basis by the GSM box and forwarded via GPRS to an FTP server, from where the data can then be downloaded.

GSM / GPRS	To be able to transmit measured data via the mobile communication network, you will need an SIM card which has been activated for data transfer using GPRS. A corresponding mobile phone contract is required here. Those contracts are provided by virtually all mobile communication operators.
FTP server	You can, e.g. have your system administrator configure storage space on an FTP server within your own server environment. Alternatively, you can also rent an appropriate server like this from any webspace provider.

10.1.4 Overview list

Listed below is an overview containing everything that you will require to build up a network of N-3 noise level loggers.

FTP storage

- Free storage space on an **FTP server**
- **FTP access data**
(Server address, port, user name, password etc. - see FTP usage agreement)

Mobile communication

- **SIM card** for the GSM box
- **Internet access data**
(Server address, user name, password etc. - see mobile phone contract)

Operating units

- **PC / laptop**
 - + with installed SebaDataView-3 software
 - + with connected radio interface (LOG RI or Reader-3)
- **Commander-3**

Network components

- **LOG N-3** noise level logger
(in sufficient quantity; if necessary with angle adapters)
- **Repeater-3** radio amplifier
(in sufficient quantity)
- **GSM box-3** network nodes
- Optional: **LOG GPS-3** GPS receiver for Commander-3 for determining location data for logger installation sites
(Alternatively a GPS-compatible **smart phone** can also be used for determining location)

Miscellaneous

- **Assembly accessories**
(e.g., cable ties for fastening GSM box and repeaters into place, etc.)
- **Network diagram and road map of application area**
- **Slip of paper and pencil**
(To make notes of communication paths that have been set up)
- **Magnet**
(For switching GSM box and repeaters on and off)
- **Smart phone or mobile phone**
(To enable the network strength or the functional capability of the SIM card for the GSM box to be checked locally)

10.2 GSM box design

A GSM box has the following features:



Element	Description
15	Status LED Flashes blue ... Configuration mode - the device is switched on and can operate wirelessly, but has not been programmed Flashes green ... The device is switched on and is within the programmed transmission window Lights up red - green - blue ... When being switched on Lights up blue - red - blue ... During programming or during a GSM test Lights up green - red ... During the path installation Lights up yellow - red ... When being switched off No light ... The device is switched off or is in energy saving mode
16	On/Off contact field ①
17	Ventilation membrane
18	Connection socket for external voltage supply

Switching on/off The GSM box is switched on using a magnetic switch.

Move the supplied magnet over the On/Off contact field 16. The status LED 15 first lights up red; after the magnet is removed it flashes green three times. If it flashes in blue regularly afterwards, this indicates that the GSM box is switched on and ready for reception.

To switch off the GSM box, hold the magnet over the On/Off contact field for a few seconds. The LED first lights up yellow. As soon as it lights up red, you can remove the magnet. The GSM box then switches off and the LED goes out.

Internal energy supply Each GSM box features internal lithium batteries. It can power the device for up to 4 years. The actual battery lifespan depends on the wireless settings of the loggers which are connected to the GSM box.

When you query the configuration of a GSM (see page 79), its battery status is also shown.

Flat batteries cannot be recharged. They must be replaced.

 CAUTION	<p>The validity of the guarantee and warranty for the device only remains unaffected if the change of battery is carried out by SebaKMT or an authorised service partner.</p> <p>Lithium batteries are classified as hazardous material. Please note the corresponding legal regulations when shipping the device.</p>
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External energy supply The GSM box can also be connected to an external 12 V voltage source, for example to a solar panel, or similar.

The connection cable supplied has been left as a non-terminated cable at one end and can be customised by the user. At the other end, the cable features a pin connector for the connection socket **18** on the GSM box. You must feel the plug engage.

As soon as an external voltage source is connected, the device is only powered from this source. As soon as this feed voltage falls below a certain level, the GSM box automatically switches back to internal voltage supply.

Observe the specifications for the GSM box in the Technical Data (see page 14).

Energy saving mode Constant wireless availability has a negative impact on the lifespan of the GSM box batteries. For this reason, there is the option of limiting the period of time in which the device can be accessed wirelessly each day.

To do this, a daily 'wireless period' is defined when programming the GSM box. Outside this period, the GSM box is in energy saving mode, which means it is switched on, but 'not responsive'. The status LED does not light up.

To check whether the device is currently in energy saving mode or switched off, briefly hold the magnet (for less than 2 seconds) over the on/off contact field **16**. When the status LED lights up in yellow, the GSM box is currently in energy saving mode.

10.3 Preparations in the office

10.3.1 Configuring FTP server and e-mail sending account

FTP server Make sure that an FTP server with sufficient storage space has been configured for storing the measurement data.

To program the logger, you will then require all the FTP access data (server address, user name, password, port etc.). You can ask your company's system administrator or the server operator for this data or it is available in your FTP usage agreement.

E-mail sender account If you wish to receive alarm messages or measurement value overviews per e-mail, an e-mail account that acts as a 'sender' account is required. If it is not possible to use one of your company's accounts, you could create an account at an external provider (such as, e.g. Yahoo or Google).

To program the logger you will then require all the access data (server address, user name, password, domain, port, etc.). The data are available from your company's system administrator or the e-mail account provider or on its Internet site.



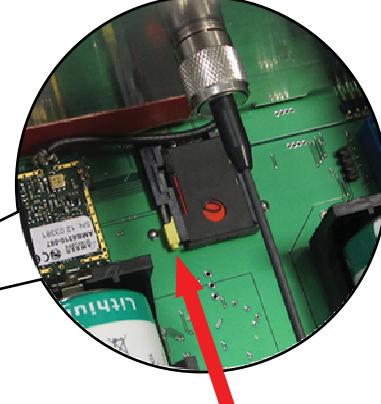
If you always use the same FTP server and the same e-mail account for working with your Sebalog devices, it may be practical to permanently store the relevant access data in the system settings for the SDV-3 (see further below in the text).

10.3.2 Inserting the SIM card

Before the GSM box can be programmed and installed on site, the SIM card for mobile communication must be inserted.

 CAUTION	<p>Proceed carefully in order not to damage any components. Do not use force and follow the instructions in the text carefully.</p>
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Proceed as follows:

Step	Description
1	<p>Undo the four screws and remove the cover from the GSM box.</p> <p>Result: The picture shows the inside of the GSM box with the slot for the SIM card:</p> <div style="text-align: center;">   </div>
2	<p>Insert the SIM card.</p> <div style="text-align: center;">  CAUTION </div> <p>The device contains sensitive semi-conductor components. Take suitable measures to prevent electrostatic discharge (ESD).</p> <p>To remove the tray for the SIM card from its fastener, press the yellow spring mechanism in the direction of the arrow (see picture). Remove the tray and place the SIM card on it so it fits. Then push the tray back into the bracket until it locks into place.</p>

(continued on the next page)

Step	Description
3	<p>Close the GSM box again. To ensure that the housing remains waterproof, observe the following points:</p> <ul style="list-style-type: none">• The rubber seal and the housing and cover surfaces which touch each other must be free of dirt.• Take care that the housing sections do not become jammed when putting them on.• Use a torque of 1 Nm to tighten the screws.

10.3.3 Determining the measuring points

Suitable measuring points for the logger network can be determined using a pipe network map as an aid. Mark the measuring points on the map. It will help you later to find a central position for the GSM box.

10.3.4 Saving FTP or e-mail access data in the SDV-3 software

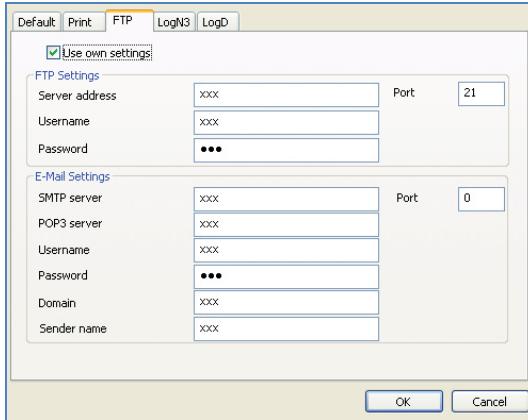
Introduction If you always use the same FTP server for working with your Sebalog devices, it may be practical to permanently store the relevant access data in the system settings for the SDV-3 software. When programming devices you can simply accept the data stored in the system settings with a 'click of the mouse', without any need to enter the data again.

The same applies for the access data for the sender e-mail account, if GSM box alarm messages or measurement data overviews are to be sent per e-mail.



This step is not 'mandatory'. It is only an option enabling you to simplify the subsequent work.

Procedure To store access data in the software, proceed as follows:

Step	Description
1	Click at the top left in the SDV-3 software on the water drop symbol  .
2	Click on Settings in the pop-up menu that appears. Result: The software system settings menu then opens in a new window.
3	In system settings open the FTP tab. Result: The following entry screen then appears in the window: 
	The FTP Settings segment contains boxes for entering access data for your FTP server. You can ask your company's system administrator or the server operator for this data or it is available in your FTP usage agreement.
	The Email Settings segment contains boxes for entering the access data for the sender e-mail account, if status or alarm messages are to be sent from the GSM box per e-mail. The data will be assigned to you by the operator of the mail account, or by your system administrator. In the Sender name field, you can enter any name, which will subsequently be used to identify the GSM box as the sender of the alarm message.
4	Click the Use own settings checkbox.
5	Enter the access data in the input boxes.
6	Click on OK to confirm the details and to close the window. Result: The access data are now permanently stored in the software. When programming the GSM box a checkbox is shown for each of the steps in the entry area, with which the stored access data can then be inserted.



Only when the **Use own settings** checkbox has been activated will it be possible at a later stage to access the stored access data for the FTP server and the e-mail account for programming purposes.

If the checkbox has not been activated, the user is then offered a choice of using a SebaKMT demo FTP server and/or a demo e-mail account.

10.3.5 Preparing a network group

Before installing the individual loggers, repeaters and the GSM box on site and pooling them into a network, the following steps must be carried out:

Step	Description
1	Creation of the GSM box as well as all loggers which are to be used in the network in the SDV-3 software.
2	Entry of the configuration data as preparation for programming the network group later on.
3	Transmission of the newly created network group from the PC to the commander.
4	Programming of the GSM box.
5	Test of the mobile communication connection.

You will find more detailed explanations of the individual steps, which must be performed consecutively, in the following paragraphs.

10.3.5.1 Selecting the zone

Open the SebaDataView-3 software on the PC and, in the directory tree at the left, mark the zone to which the new network group should be added.

Creating a new zone If you wish to create a completely new zone in the directory tree, proceed as follows:

Step	Description
1	Mark the folder in the directory tree in which the new zone should be created.
2	Open the tab Directory in the multifunction bar.
3	In the segment Zone , click on New .
4	In the window which opens, enter the Name and a Comment for the new zone and confirm the entries by pressing OK .
	Result: The new zone has now been created in the database and will appear in the directory tree.

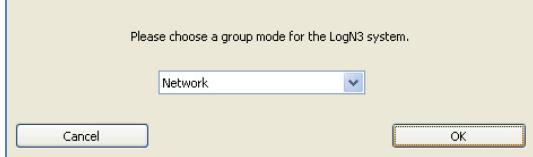
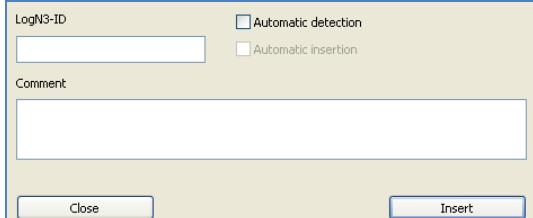
Creating a new folder If you wish to create a completely new folder in the directory tree, proceed as follows:

Step	Description
1	Mark the folder 'SebaData', or any other existing folder which the new folder should be added to as a sub-directory.
2	Open the tab Directory in the multifunction bar.
3	In the segment Folder , click on New .
4	In the window which opens, enter the Name and a Comment for the new folder and confirm the entries by pressing OK .
	Result: The new folder has now been created in the database and will appear in the directory tree.

10.3.5.2 Creating loggers

All loggers which are to be used in the network must be added to the zone selected in the SDV-3 software.

Creating loggers Proceed as follows:

Step	Description
1	Mark the zone in the directory tree to which the loggers should be added.
2	Open the tab LogN3 in the multifunction bar.
3	In the segment Administration , click on New . Result: The following window opens. 
4	From the drop-down list, select the group mode Network and confirm by pressing OK . Result: The following window opens. 
5	Enter the identification number (see page 20) of the first logger. Manual entry: Deactivate the two checkboxes in the window. Enter the ID of the logger directly in the input field and, if required, change the automatically created comment text. Automatic detection: (only possible when a wireless interface Log RI or Reader-3 is connected to the PC) Activate the checkbox Automatic detection . Move the switched-off logger closer to the PC and switch it on. Result: The ID of the logger is displayed. If necessary, change the comment text which was created automatically. Using Insert , confirm your entry and add the logger to the zone.

(continued on the next page)

Step	Description
6	<p>Use the same method to add all the other loggers to the zone.</p> <p>If you activate the checkbox Automatic insertion, every logger detected during automatic detection will be immediately added directly to the zone.</p> <p>i During automatic detection, only ever bring loggers to the PC individually, switching them on one after the other.</p> <p>During automatic log on, all loggers are detected which are currently switched on within range of the wireless PC interface, which may include some which are not meant to be included in the network group. If the checkbox Automatic insertion is activated at the same time, such loggers may be added to the selected zone without you noticing.</p>
7	<p>Quit logger creation using the Close button.</p> <p>Result: The window closes. All loggers in the network group have now been created in the software and will appear under the selected zone in the directory tree.</p>
8	Double-check whether all required loggers are actually included in the zone.

Deleting loggers If a logger which has already been created should no longer be included in a network group, remove it from the zone concerned.

Proceed as follows:

Step	Description
1	Mark the logger to be deleted in the directory tree.
2	Open the tab LogN3 in the multifunction bar.
3	In the segment Administration , click on Delete .
	Result: The corresponding logger is removed from the directory tree.

10.3.5.3 Creating a GSM box

The GSM box which is to be used in the network must be added to the zone selected in the SDV-3 software.

Proceed as follows:

Step	Description
1	Mark the zone in the directory tree to which the GSM box should be added.
2	Open the tab GSM Box3 in the multifunction bar.
3	In the segment Administration , click on New .
4	In the window which opens, enter the identification number (ID) of the GSM box and a comment, and confirm the entries using OK .
	Result: The GSM box has now been created in the software and appears in the directory tree under the zone selected.

10.3.5.4 Entering and saving configuration data

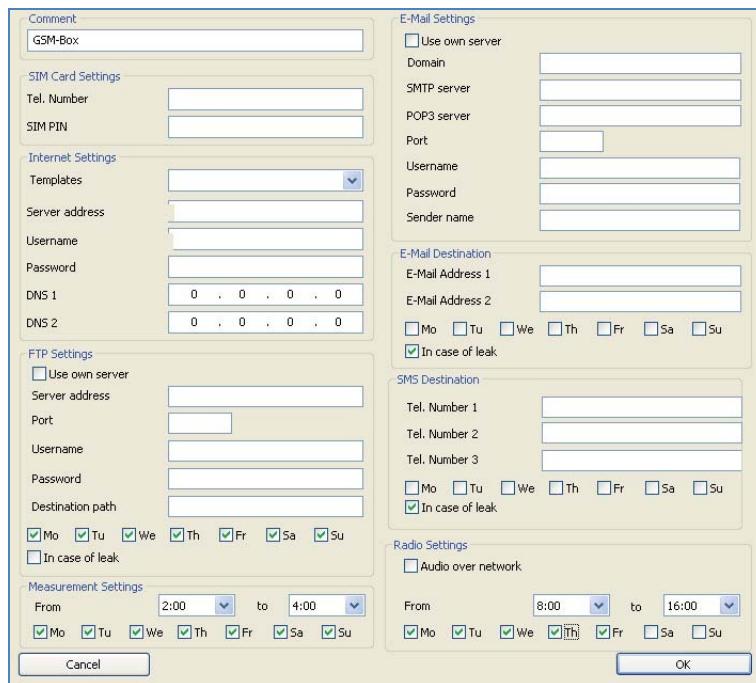
Introduction All devices in the network group are programmed the same way.

The configuration data must only be entered once. The GSM box is programmed first.

Over the course of the path installation (see page 116), the GSM box will relay the configuration data to all the devices connected in the network.

Entering configuration data Mark the GSM box for the group in the directory tree in the SDV-3 software, and open the tab **GSM Box3** in the multifunction bar. In the segment **Communication**, click on **Program**.

The dialogue for programming the GSM box appears on the screen. Enter the data you are prompted to enter.



You will find explanations on the individual segments of the configuration dialogue in the following table:

Segment	Parameter
SIM Card Settings	<p>Enter the Tel. number and the PIN code of the SIM card which is being used in the GSM box. You can find this information in the material accompanying your mobile phone contract. Otherwise, please contact your mobile communications provider.</p> <p>Info: The card's SIM-PIN prompt must be activated to be used in the GSM box! Otherwise there may be problems in setting up a mobile phone connection.</p>

(continued on the next page)

Segment	Parameter
	<p> (Generally, each SIM card must be unlocked prior to use by entering the PIN code. This safety precaution may however, have been deactivated in the configuration. To check if this is the case you can simply place the SIM card into a mobile phone. If after switching-on there is no prompt for a PIN code, you can use the phone to change the corresponding setting on the SIM card so that the PIN prompt is then activated.)</p>
Internet Settings	<p>Enter the data required for internet access. You can find this information in the material accompanying your mobile phone contract. Otherwise, please contact your mobile communications provider.</p> <p>If you can find your mobile communications provider in the drop-down list of Templates and you select it, then the aforementioned data will be entered automatically.</p>
FTP Settings	<p>The access data for the FTP server to which the measurement data are to be sent must be entered here. The data (server address, port, user name, password) will have been notified to you when you concluded the FTP usage agreement or you can ask the FTP server provider for the data.</p> <p>If you have already entered the access data for your servers in the software's system settings and you wish to use this server, mark the Use own settings checkbox. The data in the system settings are then accepted and the data appears in the input boxes.</p> <p>If you wish to use the SebaKMT demo server, mark the Seba Demo Mode checkbox. The access data are then entered automatically. (Please note that this server may be used temporarily and for demonstration purposes only!)</p> <p>Use the checkboxes Mo - Su to define the days of the week on which the measured data from the last measuring period should be sent from the GSM box to the FTP server.</p> <p>If you mark the checkbox In case of leak, the measured data from the last measuring period will only be sent to the FTP server when the leak threshold of at least one logger in the network has been exceeded.</p> <p>Example: The checkboxes Mo and In case of leak are marked. All measured data from the last measuring period will be placed on your FTP server every Monday. On the remaining days of the week, you will only receive the data when the programmed leak threshold was exceeded on one logger during the last measuring period.</p>

(continued on the next page)

Segment	Parameter
Measurement Settings	<p>Specify the measuring period for the loggers in the network. Specify the days of the week on which the measuring period should apply.</p> <p> A measuring period from 2 a.m. to 4 a.m. is recommended. Due to system constraints, measurement spanning different days (for example, from 11 p.m. - 1 a.m.) is not possible.</p>
E-mail Settings	<p>If you wish to receive alarm messages in the event of suspected leaks, enter the access data (Domain, Server address, Port, User name, Password) of the e-mail account from which the messages are to be sent. The data will be assigned to you by the operator of the mail account, or by your system administrator.</p> <p>In the field Sender name, you can enter any name, which will subsequently be used to identify the GSM box as the sender of the alarm message.</p> <p>If you wish to use the SebaKMT demo account, mark the checkbox Seba Demo Mode. The aforementioned data are then entered automatically.</p>
E-mail Destination	<p>You can specify up to two e-mail addresses here to which messages with the most important measurements from the last measuring period should be sent.</p> <p>Use the checkboxes Mo - Su to define the days of the weeks on which messages like these should be sent.</p> <p>If you mark the checkbox In case of leak, this message will only be sent if the leak threshold was exceeded on at least one logger in the preceding measuring period.</p>
SMS Destination	<p>You can specify up to three mobile phone numbers here to which messages containing the most important measurements from the last measuring period should be sent.</p> <p>Use the checkboxes Mo - Su and In case of leak to define when messages like these should be sent (see above).</p>
Radio Settings	Specify the transmission window (see page 20) for the devices in a network.

Saving configuration data Once you have finished entering the configuration data, click on **OK** in the configuration dialogue. This will save the data in the database of the SDV-3 software.

10.3.6 Transferring a network group from the PC to the commander

Introduction Programming the GSM box and all other steps when setting up the network are carried out with the help of the commander. For this reason, the network group created in the SDV-3 software must be exported from there and copied into the database of the commander.

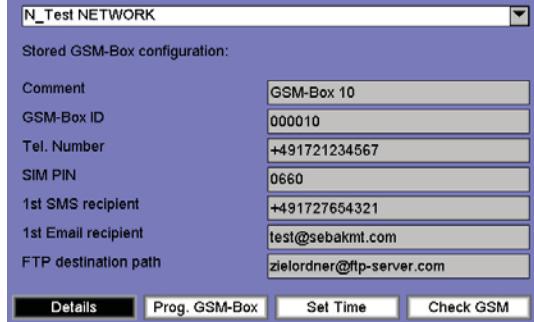
Procedure Proceed as follows:

Step	Description
1	Connect the commander and the PC with each other. To do so, select the symbol  in the main menu bar of the commander, followed by the Connect to PC button. Follow the instructions on the screen. Once Connected is displayed, there is a connection. The commander will be identified as a USB mass storage device by the PC.
2	In the directory tree of the SDV-3 software, mark the zone in which the network group which is to be copied to the commander is located.
3	Open the tab Directory in the multifunction bar.
4	In the segment Zone , click on Export .
5	In the window which opens, select the Commander button.
6	In the Explorer window which opens, select the main directory of the commander as the destination and save the data for the zone there. Result: Once the data transfer is successful, a corresponding message appears on the PC. The entire network group with all loggers, along with the GSM box and the configuration data, has now been created in the commander. <u>The name of the group in the commander is identical with the name of the zone to which the loggers and GSM box have been assigned in the SDV-3 software.</u>
7	Disconnect the commander from the PC.

10.3.7 Programming the GSM box

When programming, the configuration data previously saved in the commander are transferred to the GSM box.

Proceed as follows:

Step	Description
1	The GSM box must be switched on.
2	In the commander, the network group must be registered as a workgroup (see page 20).
3	Make sure that the commander is set to the correct time (displayed at the lower right of the screen). The time can be changed in the system settings (see page 33).
4	In the main menu of the commander, select the symbol  .
5	Select the Install GSM box button. Result: The most important configuration data stored for programming the GSM box in this group are displayed in the next view. 
	If necessary, you can select a different network group by using the drop-down list at the top edge of the screen.
6	If you wish to view the entire configuration data, or if you wish to change the data again, select the Details button. Result: All the configuration data last set are displayed. Using the Next and Previous buttons, you can scroll through the individual menu pages. To change the displayed configuration data, use the input fields or press the symbol  next to the lines concerned and create new entries. You can return to the preceding menu using the arrow symbol.
7	Press the Prog. GSM box button. Result: The ID and the comment for the GSM box concerned will be displayed again in the next view.

(continued on the next page)

Step	Description
8	<p>Select the Program button.</p> <p>Result: Transmission of the configuration data from the commander to the GSM box begins. The transmission progress is displayed on the commander screen as a bar.</p> <p>Once the data have been received, the GSM box will conduct a 'plausibility check'. This includes checking the SIM PIN and the measurement and wireless settings. The result is displayed:</p> <ul style="list-style-type: none"> • SIM PIN: OK ... The PIN code entered for the SIM card is correct. Error ... The PIN code specified is incorrect. Press the symbol  and enter the correct PIN code. • Plausibility of timeframes: OK ... There is enough time for reading out the measured data from the loggers between the end of measurement and beginning of the transmission window ('Radio ON'). Error ... The interval between the end of measurement and beginning of the transmission window ('Radio ON') is too short. The transmission window will therefore be postponed automatically. The corrected times are displayed.
9	<p>Select the Next or Accept button to complete the programming of the GSM box, and to return to the preceding view.</p>

When programming, the internal clock in the GSM box is automatically synchronised with the commander time.

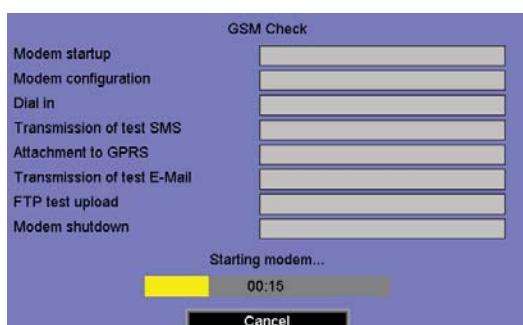
The configuration which was transmitted is retained even after the GSM box is switched off.

After programming the GSM box, a GSM check should be performed (see below). This allows you to determine and rectify potential problems while you are still in the office.

10.3.8 Testing the GSM connection

Using the function **GSM Check** as an aid, you can check your internet, FTP, e-mail and SMS settings.

Proceed as follows:

Step	Description
1	The GSM box must be switched on and programmed.
2	In the commander, the network group must be registered as a workgroup (see page 20).
3	In the main menu of the commander, select the symbol  .
4	Select the Install GSM box button. Result: The most important configuration data for the GSM box for this group are displayed in the next view. If necessary, you can select a different network group by using the drop-down list at the top edge of the screen.
5	Press the Check GSM button. Result: The ID and the comment for the GSM box concerned will be displayed again in the next view.
6	Press the Send Command button. Result: The test begins. The individual steps in the test are listed on the screen in chronological order. Alongside each step, a display appears showing whether the step was able to be completed successfully or not. 

The following test messages are sent by the GSM box:

- Test SMS to the telephone numbers stored in the configuration
- Test e-mail to the destination addresses stored in the configuration
- Test file to the target folder on the FTP server

The messages include the respective ID of the GSM box.

The test file additionally includes the configuration data of the GSM box.

If all messages were able to be received, the GSM test was successful.

If not, check the configuration data of the GSM Box again carefully (see page 79).

If you change the data, the GSM box must be programmed once again (see page 105). Also make certain that the quality of the mobile communication network is actually sufficient at your location to establish a stable connection (e.g. using a mobile phone which uses the same mobile communication network as the GSM box). Then repeat the GSM test.

The network can now be set up in the area of operation with the aid of the commander.

10.4 Setting up a network on site

10.4.1 Installing the GSM box

10.4.1.1 Attaching the GSM box

Searching for an installation point Using the pipe network map as an aid, you have already just about found a central position for the GSM box within the logger network (see page 96). Now go to this location and search for a suitable on site point to attach the GSM box. When doing this, observe the following points:

- The point of installation should be somewhat elevated, e.g. at a height of 3 m to 5 m on a lamp post, or similar
- The GSM box should not be too easily accessible, to prevent theft or vandalism
- The GSM box must not be a nuisance to anyone or infringe any property laws
- While measurements are made, external influences should not impair the wireless connection

You can, for example, attach the GSM box to a street lamp or a house wall etc.

Switching on and fastening the GSM box Once you have found a suitable position, switch the GSM box on and attach it at the chosen position. The side of the device with the connection socket for the external voltage supply **18** must point downwards. To attach it, use the supplied cable ties, for example, or any other form of fastening that does not cause damage.

10.4.1.2 Setting the time

Introduction A GSM box which has already been programmed does not have to be programmed again when it is switched on again.

If you wish to change the programming again, repeat all steps which were described in the section on programming the GSM box (see page 105). The GSM box clock is synchronised with that of the commander.

If you wish to leave the programming unchanged, the internal clock of the GSM box must be reset after turning it on again, using the commander as an aid.

Procedure Proceed as follows:

Step	Description
1	Make sure that the commander is set to the correct time (clock at the lower right of the screen). The time can be changed in the system settings (see page 33).
2	In the commander, the network group must be registered as a workgroup (see page 52).
3	In the main menu of the commander, select the symbol  .
4	Select the Install GSM box button.
	Result: The most important configuration data for the GSM box for this group are displayed in the next view. If necessary, you can select a different network group by using the drop-down list at the top edge of the screen.

(continued on the next page)

Step	Description
5	Press the Set Time button. Result: The ID and the comment for the GSM box concerned are displayed once again.
6	Press the Set Time button again. Result: The commander time will be transmitted to the GSM box. The progress of the transfer is displayed on the commander as a bar.

10.4.1.3 Testing the GSM connection again

After mounting the GSM box on site it is advisable to perform a GSM test again to ensure that the mobile phone connection actually works (see above in the text).

10.4.2 Installing the loggers and setting up the communication paths

Introduction After successfully attaching the GSM box, each individual logger must be installed on site and connected to the GSM box.

If the distance between the logger and the GSM box is too big for a direct radio connection, up to 10 repeaters can be installed for extending the range between the two devices. Repeaters record the radio signals, amplify them and then forward them.

The radio signal path between a logger over all the integrated repeaters and up to the GSM box is known below as the 'path'.

The sum of all paths ultimately forms the network.

Procedure To create a path, proceed with the following steps:

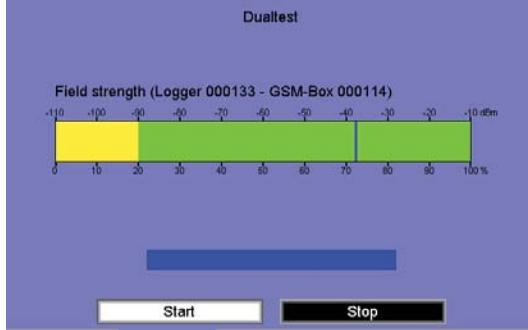
Step	Description
1	The GSM box must be switched on.
2	Take the first logger which is to be used in your hand and switch it on.
3	Attach the logger to the chosen position on the pipe (see page 24).

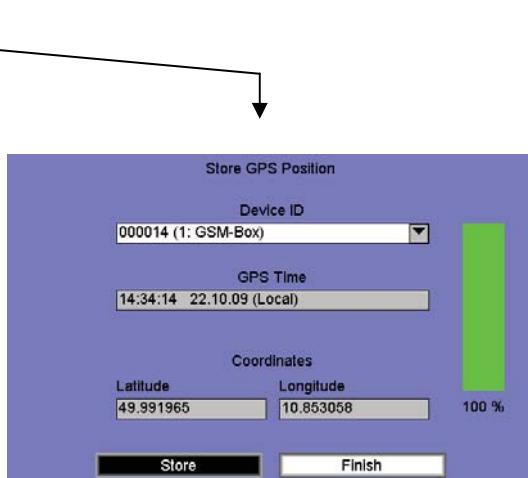
The quality of the wireless connection between this logger and the GSM box must be checked next, with the aid of the 'Dual test' function. To do so, both devices must be within the transmission range of the commander.

4	To perform a dual test, select the symbol  in the main menu of the commander.
5	Select the Dual test button.
Result: The following view opens:	
	 <p>Enter device-IDs for dualtest</p> <p>Device 1</p> <p>Device 2</p> <p>Start Dualtest</p>

Enter the identification numbers of the two devices to be connected wirelessly in the two fields.

(continued on the next page)

Step	Description
5a	Select the  button to the right of the first field. Result: The dialogue for entering the device ID opens on the screen.
5b	Enter the ID of the first device and confirm using ENTER, or use 'Automatic detection'. For automatic detection, move the switched-off device into the vicinity of the computer, switch it on and confirm the displayed ID using the buttons Accept and Finish (see page 30). Result: A new view opens.
5c	Specify whether this device is a GSM box, a repeater or a logger, and confirm using the OK button. Result: The screen jumps back to the view shown above. The ID of the first device appears in the first field.
6	Use the same method to enter the ID of the second device in the second field. Result: The ID of the second device appears in the second field.
7	Press the Start Dual Test button. Result: The test begins. The commander sends a signal to both devices. As a result, a connection is established between the two devices. The following view opens on the screen:  The vertical blue line (pointer) in the bar indicator shows the current strength of the wireless connection between the two devices. Green area ... Excellent connection Yellow area ... Good to satisfactory connection For a stable connection, the pointer should clearly remain in the green area . The number of wireless 'packets' which have been successfully exchanged by the two devices is shown below the signal strength display. There should be at least 15 - 25 packets received without any interruption . If a large number of 'lost packets' are consistently displayed, then the connection is not satisfactory. If the dual test does not start and an error message appears, then both devices (here: logger and GSM box) are outside the transmission range of the commander. Move into the wireless range of one of the devices.
	<p> Stable radio links between the individual devices are crucial to the functioning of the entire network.</p> <p>Proceed carefully and take enough time when performing a Dualtest.</p> <p>If the test indicates no sufficiently good connection, position one of the devices new until the connection can be clearly considered stable.</p>

Step	Description
8	<p>You end the dual test using Stop.</p> <p>Result: The dual test is finishing. The following view appears on the screen.</p>
	 <p>The IDs of the two devices and the last measured signal strengths are shown again.</p>
	<p>You will be asked whether you wish to save this test (i.e. the details displayed) in the Commander. Along with all further dual tests that have not yet been performed, a list is compiled which will provide later on you with an overview of all the dual tests conducted for this particular network group. Apart from this, you are also provided with an option here to determine and store the GPS positions of both devices involved. The position data should make it easier and faster for you to install the communication paths later on.</p>
9	<p>If you wish to save this dual test, select the Yes button.</p> <p>If you do not wish to save this dual test, select the No button.</p>
	<p>Result: The data are saved. At the same time the menu for determining the GPS data appears on the screen:</p>
	 <p>This screen helps you to determine and save the GPS coordinates for the installation positions of the two devices involved in the dual test.</p> <p>To do so, the LOG GPS-3 receiver (available as an option) must be connected using the USB socket 10 to the Commander. You must feel the device latch into place! It is immediately switched on and it starts to search for available satellites. The status LED lights up blue.</p> <p>After a while, the current GPS time is displayed.</p>

(continued on the next page)

Step	Description
	<p>As soon as the position of the commander can be calculated, the current latitude and longitude are specified.</p> <p>The vertical bar at the right of the screen indicates how high the accuracy is with which the position can currently be determined.</p> <p> The first time the current position is determined after connecting the GPS receiver may take a little time. The commander should not be moved during this phase. It is best to put it down somewhere.</p>
10	<p>If you wish to determine the GPS data, perform steps 10a to 10e.</p> <p>If you do not wish to determine the GPS data, select the Finish button and ignore steps 10a to 10e.</p> <p>Result: The dual test is saved. The data are immediately stored in the dual test list. The screen reverts to the dual test menu.</p>
10a	In the Devices ID drop-down menu, select the device whose position is to be determined.
10b	Move as close as possible to the device with the Commander.
10c	Note the degrees of longitude and latitude. As soon as the value no longer fluctuate or do so minimally only, select the Store button. The bar at the right in the screen, which reflects the accuracy of the position, should be green here.
	Result: The GPS position for this device is now stored in the Commander.
10d	To determine and store the position of the second device involved in the dual test, move to its installation location and repeat steps 10a to 10c for this device.
10e	To stop determining the GPS data, select the Finish button.
	Result: The determined GPS data are added to the previously stored dual test and the data are immediately filled in the dual test list. The screen reverts to the dual test menu.

If the dual test displays a good connection between the logger and the GSM box, this communication path is then deemed to have been successfully set-up.

 Make a note of this connection, as well as all subsequent paths which you set up (see text below too). These notes will be required later on when 'Installing' the network on the Commander.

If the dual test indicates an inadequate connection between the logger and GSM box, or if the dual test does not start, then the use of repeaters will be necessary (see page 84).

Extending the wireless signal from logger to GSM box You can integrate one or more repeaters into a path. Further dual tests are also performed between the individual devices.

Proceed as follows to install a repeater between the logger and GSM box:

Step	Description
11	Open the Dualtest menu on the commander described in step 5.
12	Enter the ID of the logger in the first field.
13	Enter the ID of the repeater in the second field.
14	Press the Start Dualtest button. Result: The dual test begins. The strength of the wireless connection between the logger and the repeater is displayed.
15	Take the repeater and move away from the logger towards the GSM box. Observe the display on the commander and look for a suitable place to attach the repeater. Observe the information on attaching repeaters in the section on extending the transmission range (see page 85).
16	Following installation of the repeater, finish the dual test with Stop .
17	To save this test, select the Yes button. After this you can determine and save the GPS data for the repeater position. To this end, repeat step 10. If you do not wish to save this test, select the No button. The screen then reverts to the dual test menu.

After you have installed the repeater in a suitable place, perform another dual test to check the connection between the repeater and the GSM box. To do so, repeat steps 11 to 17. This time, enter the ID of the repeater you have just installed in the first field. Enter the ID of the GSM box in the second field.

If the dual test indicates there is a good connection between the repeater and GSM box, then the communication path between the logger and GSM box can be considered as set up seamlessly, and can be successfully installed later on.

If the dual test indicates there is only a poor connection between the repeater and the GSM box, or if no connection can be established, then it will be necessary to use another repeater.

Integrating further repeaters To integrate another repeater in the path, perform another dual test. To do so, repeat steps 11 to 17. This time, enter the ID of the repeater you last installed in the first field. Enter the ID of the repeater with which you are extending the path in the second field.

Keep repeating this procedure until a continuous path from the logger to the GSM box with good connection quality has been established between the individual devices.



Due to system constraints, a path can include a maximum of 10 repeaters.

Integrating previously installed repeaters When creating a path, you can make use of repeaters previously installed in another path, when practicable.

'Repeater No. 3' is therefore both a component of Path 3 as well as Path 4 in the schematic diagram at the start of this chapter (see page 87).



A repeater can be integrated into a maximum of 10 paths at the same time.

Taking notes For the subsequent 'installation' of all communication paths, it is necessary to make a note of each path directly after it has been set up on site.

Your notes can, for example, appear as follows:

Note 1:

GSM box 10 —— Repeater 117 ————— Logger 133 ← **Path 1**

Note 2:

GSM box 10 —— Repeater 117 ————— Logger 133 ← **Path 1**
 ————— Repeater 22 ————— Logger 134 ← **Path 2**

and so forth...

This allows you to retain an overview of the entire network after setting up all the paths.

Completing path set-up The communication paths have been completely set up once all required loggers have been installed, and all wireless links between the loggers and the GSM box have been configured.

In the next step, the individual paths in the network must be 'installed' with the aid of the commander.

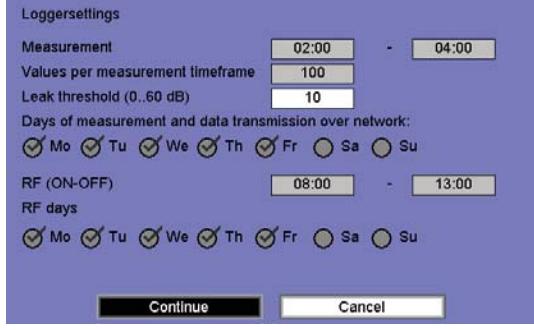
10.4.3 Installing paths

Introduction After attaching the individual devices on site, the so-called 'path installation' is performed.

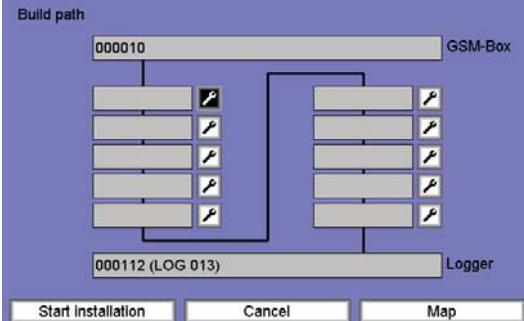
This means that each communication path in the network is created individually in the commander. The command then sends a signal to the logger in the path via the GSM box and the individual repeaters. This links the devices with each other, programming them at the same time.

At the end of the installation, the individual devices in the network 'know' the other devices with which they form a respective path.

Procedure To register the individual paths in the network in the command, proceed as follows:

Step	Description
1	In the main menu of the commander, select the symbol  .
2	Select the Path management button. Result: The loggers in the network group are shown in a list.
3	If the correct group is not displayed, then use the drop-down menu on the upper edge of the screen to select the correct logger group.
4	Take your notes on the installed paths in your hand.
5	From the list displayed on the commander, select the logger whose communication path is to be installed first. The order in which the individual communication paths are installed is irrelevant for the measuring system.
6	Select the Install path button. Result: A new view opens on the screen. 
7	The measurement and wireless settings are displayed with which the GSM box was programmed (see page 105). The same settings are now used for programming the logger.
	In the line Leak threshold , enter the required leak threshold (see page 20) for the logger in the path.

(continued on the next page)

Step	Description		
8	<p>Select the Continue button.</p> <p>Result: A new view opens on the screen.</p>		
	 <p>The view shows the path for installation as a diagram. The line at the top of the image symbolises the GSM box. The line at the bottom of the image symbolises the logger. The IDs of up to 10 integrated repeaters in the path can be entered between them.</p>		
	<p>Info: The order of repeaters from the GSM box to the logger which is displayed on the screen must match the actual order of repeaters on site!</p>		
9	<table border="0"> <thead> <tr> <th data-bbox="461 1057 952 1102">Path without repeater</th> <th data-bbox="952 1057 1447 1102">Path with repeaters</th> </tr> </thead> </table>	Path without repeater	Path with repeaters
Path without repeater	Path with repeaters		
	<p>If in this path the GSM box and the logger are connected directly with each other, the 10 input boxes displayed can be ignored and you may continue with step 11.</p> <p>If repeaters are used in this path between the GSM box and the logger for radio extension, then the repeaters must all be entered one after the other into the screen.</p>		
	<p style="text-align: center;">↓</p> <p style="text-align: center;">Two options</p>		
	<p style="text-align: center;">↓</p> <p>Enter repeater IDs individually</p> <p>Select the symbol  at the right next to each input box. Enter the ID of the relevant repeater using the displayed keypad and confirm with ENTER.</p> <p>Enter the IDs for all the path repeaters in this manner, one after the other in this screen.</p> <p>Advantage: functions quickly and clearly</p> <p>Requirements:</p> <ul style="list-style-type: none"> • all the previously conducted dual tests must have been saved • the GPS positions of all devices in the network group must have been saved 		

(continued on the next page)

Step	Description
	<p>Procedure: Press the Map button. Use the arrow key ('Select') and the checkmark key ('Confirm') to trace the course of the path in the displayed network from the logger (green dot) to the GSM box (blue dot). Finally, confirm with OK. You find a comprehensive explanation on the 'Map' functions in a specific section below in the text (see page 120).</p>
Result:	The input boxes now contain the IDs for the path repeaters.
10	Use your notes to check again whether the displayed sequence of repeaters matches the actual sequence in the path.
11	<p>Press the Start installation button.</p> <p>Result: Installation of the path begins. The GSM box sends the configuration data to the path repeaters and the logger. The logger responds to the contact and sends a response through the repeaters back to the GSM box. A yellow bar on the screen shows the installation progress. The Stop and Start buttons can be used to cancel the procedure or start it over. Once the procedure has finished, the screen will show you whether the installation was successful. If the installation was not successful, check whether the correct device IDs were entered in the correct order, and repeat the procedure.</p>
12	<p>Press the OK button.</p> <p>Result: The path is now installed, which means:</p> <ul style="list-style-type: none"> • the logger in the path is programmed and knows which repeater is next to it • the repeaters know their respective 'neighbours to the left and right' in the path • the GSM box knows which loggers it will receive via which repeaters • all devices in the path were synchronised with the commander time

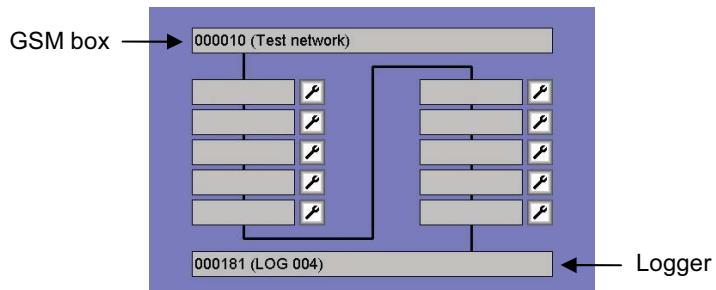
To install all other communication paths in the network one after the other, repeat steps 5 to 12.

Once all paths have been installed, the network has been completely configured and is ready for operation.

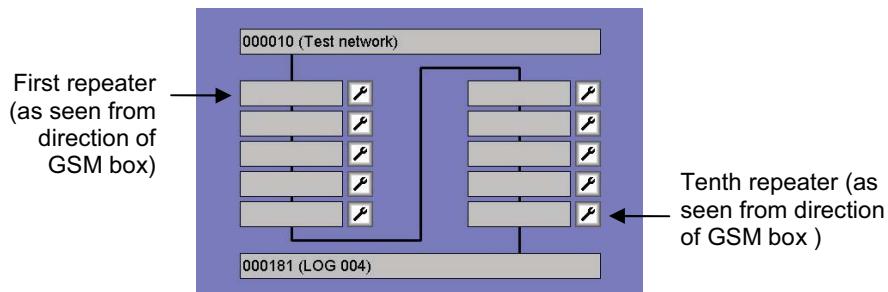
10.4.3.1 Explanations on 'manually entering' repeater IDs

Introduction The entry screen from step 8 displays the communication path between the GSM box and a logger.

The field at the top of the screen represents the GSM box and its ID. The field at the bottom of the screen represents the logger and its ID. The two fields are connected to each other by a black line, which symbolizes the radio connection between the two devices.

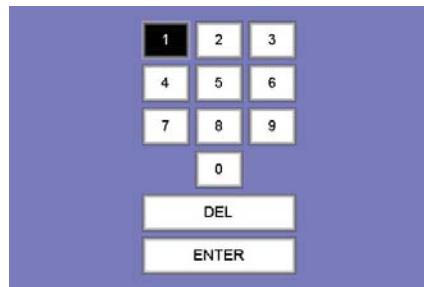


Located along the line are 10 input boxes, in which the identification numbers of max. 10 repeaters, that are integrated for extending the radio signal in path, have to be entered.



Procedure In the first field at the upper left of the screen, enter the ID of the repeater which is closest to the GSM box. The next repeater should then be entered in the field below and so on.

In each instance select the  symbol at the right next to the input box. Then use the keypad shown to enter the ID. You can revoke the last entry using DEL. With **ENTER** you can confirm the ID and return to the input screen. The ID is then shown there.



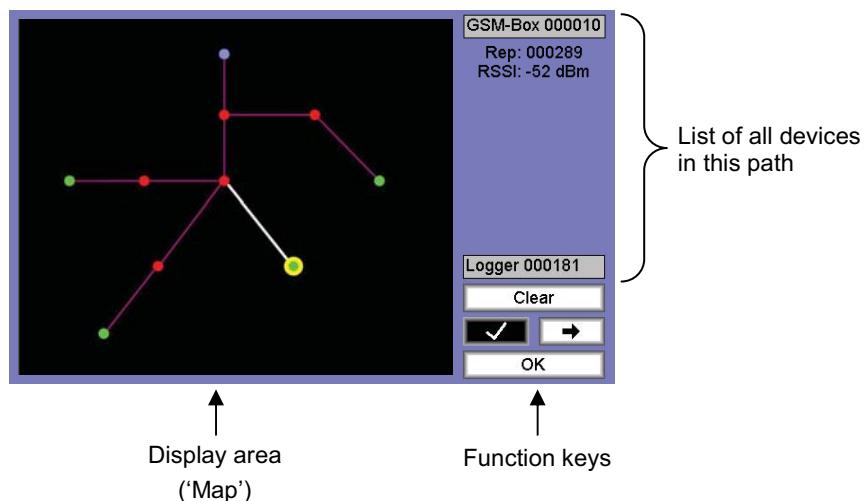
Please note that the repeater sequence on the screen must reflect the actual repeater sequence on site!

10.4.3.2 Explanations on 'Map' function

Introduction The **Map** function is an alternative method for entering the repeater ID. The function outlines the network of GSM box, loggers, repeaters and the tested radio connections on the screen in the form of a diagram. The path to be installed can be 'marked' by the user in this diagram. The IDs of the repeaters involved are automatically accepted into the screen from step 8 (see page 117).

Requirement The GPS positions for all devices in the network group must be known (see page 112).

Design After activating the function a view is opened as on the following screen:



In the **Display area** all the devices in the network group are shown as coloured dots and they are arranged in space relative to each other by means of their GPS data. This method simulates the installed network in diagram form.

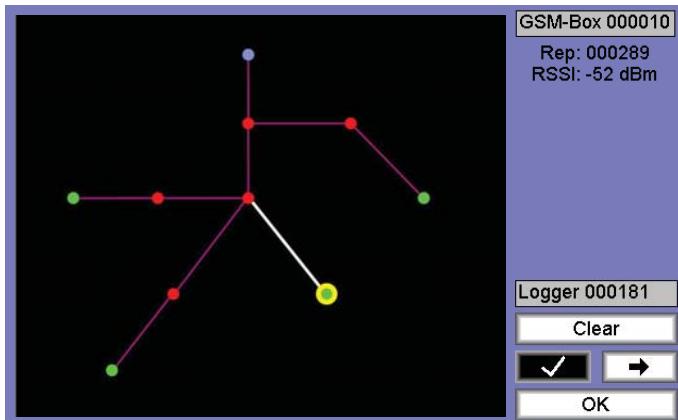
Green dots ... Logger
 Red dots ... Repeater
 Blue dot ... GSM box

The lines between the dots indicate where dual tests were conducted between the devices.

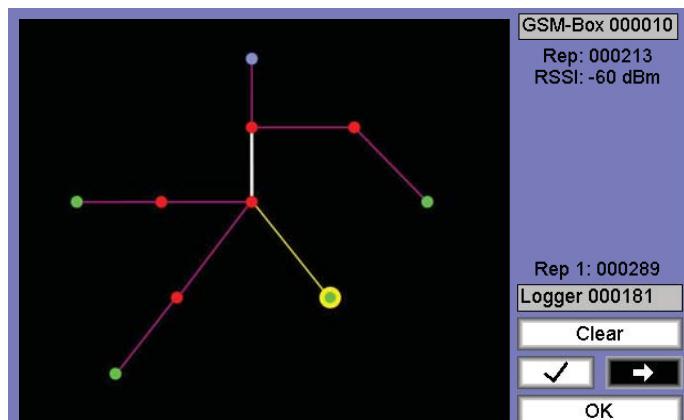
The **List** at the right next to the display area contains the ID of the GSM box (top) and the ID of the logger for this path (bottom). Listed in between this are the repeaters that are currently marked on this map for the path.

You can use the displayed **Keys** to mark out the path from the logger to the GSM box on the map.

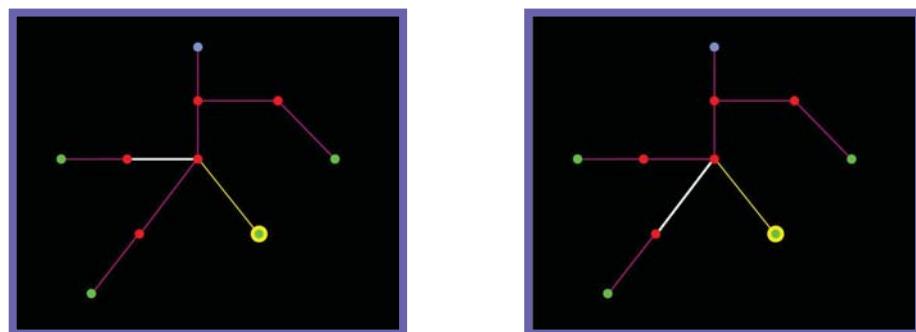
Procedure The path logger is marked on the map (green dot with yellow border). From there the Commander then suggests one of the marked radio connections as the next path section option. The suggested connection is then highlighted in white. The ID of the repeater at the end of this connection is shown at the top right of the picture, along with the signal strength that was measured during the dual test for this radio signal path.



You can use the checkmark key to accept the suggested connection as a section of the path. The relevant section then changes its colour from white to yellow whereupon it is recognisable as a path section. The ID of the repeater concerned is added at the right to the list of path repeaters. At the same time the next path section is then suggested by the Commander.



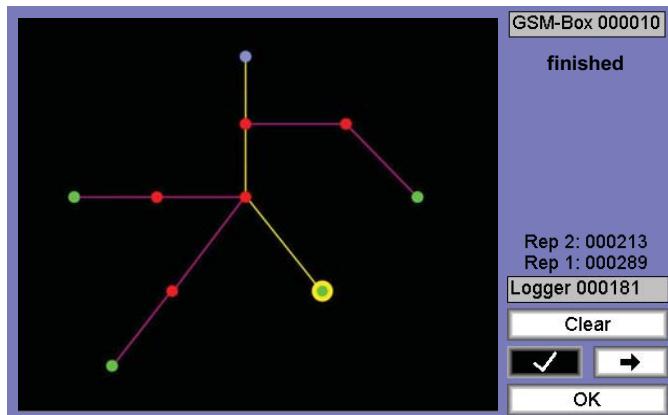
If you are not satisfied with the suggested connection highlighted in white, use the arrow key , to successively display all the other connections that could be considered for the next path section.



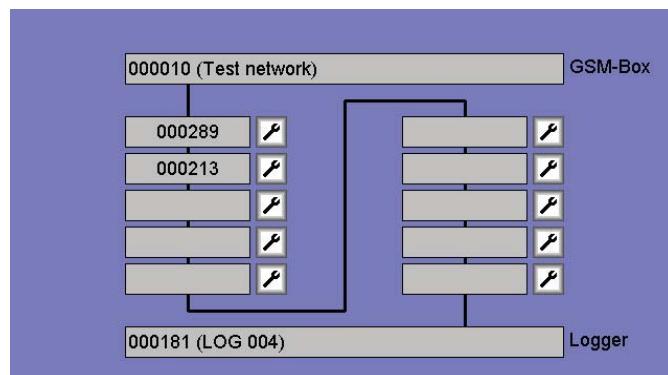
Using the arrow and checkmark keys define all the path sections one after the other from the logger (green-yellow dot) to the GSM box (blue dot).

By using the **Clear** key you can remove all previously accepted repeaters from the repeater list, and then start marking the path again from the beginning.

The path is complete as soon as the map from the logger to the GSM box displays a chain of sections marked in yellow. Apart from this, the repeater list shows the **Finished** message at the right.



You can close the **Map** function using the **OK** key and return to the previous view. The repeater IDs for the marked path are now entered in the corresponding fields.



10.5 Procedure on a measuring day

Introduction Following path installation, all devices in the network remain in configuration mode until the end of the day. At midnight, each device will switch to the programmed daily routine. From this point in time, the measuring and transmission windows apply.

The loggers begin with measurements as they have been programmed to. Following each measuring period, the data recorded are read out of the individual loggers and saved in the GSM box to a fixed chronological routine. From there, the required messages are sent as e-mails and SMS by mobile communication. The measured data are then sent to the FTP server. From there, they can be accessed using any PC with internet access which has the SebaDataView-3 software installed on it.

Chronological routine Recording and reading out the measured data via network is done to a strict chronological routine. When there is a standard measuring period from 2 a.m. to 4 a.m., this routine appears as follows:

Action	Time / duration
1. Measurement	2 a.m. to 4 a.m.
2. Network synchronisation	5 a.m. to 5.20 a.m.
3. Wireless transfer of the measured data from the loggers to the GSM box	5.20 a.m. to 5.43 a.m.
4. Transfer of measured data from the GSM box to the FTP server via mobile communication	5.43 a.m.
5. Logger 'Transmission on'	from 8 a.m. (6 a.m. at the earliest)
6. Logger 'Transmission off'	to 4 p.m. (by 4 a.m. at the latest the next day)

Limitations When programming a network group, the standard configuration can be modified, for example to set a different measuring time. However, due to system constraints, '1 a.m.' is the earliest possible start to measurements.

If the time for ending the measurements is changed, then the network synchronisation and the data transfer are offset accordingly.

Measurements extending over midnight (e.g. from 11 p.m. to 1 a.m.) are not possible.

The earliest possible begin for the transmission window ('transmission on') is always two hours after the end of measurements.



SebaKMT recommends always operating a network using the standard configuration to ensure measurements and data transmission proceed smoothly.

10.6 Accessing and evaluating measured data

10.6.1 Accessing data from the FTP server using a PC

You can download the measured data for a group from the FTP server to your PC with the aid of the SebaDataView-3 software.

Step	Description
1	Start the SDV-3 software on your PC.
2	Mark the zone in the directory tree in which the network group loggers, from which you wish to download the measured data, are found. (If the zone concerned does not appear in the directory tree, start by creating the zone in the software (see page 98) and then add the GSM box for the network group to it (see page 100)).
3	Open the tab Directory in the multifunction bar.
4	In the segment Network , click on FTP Download . Result: The measured data are downloaded from the FTP server. The progress of the data transfer is displayed in a window.

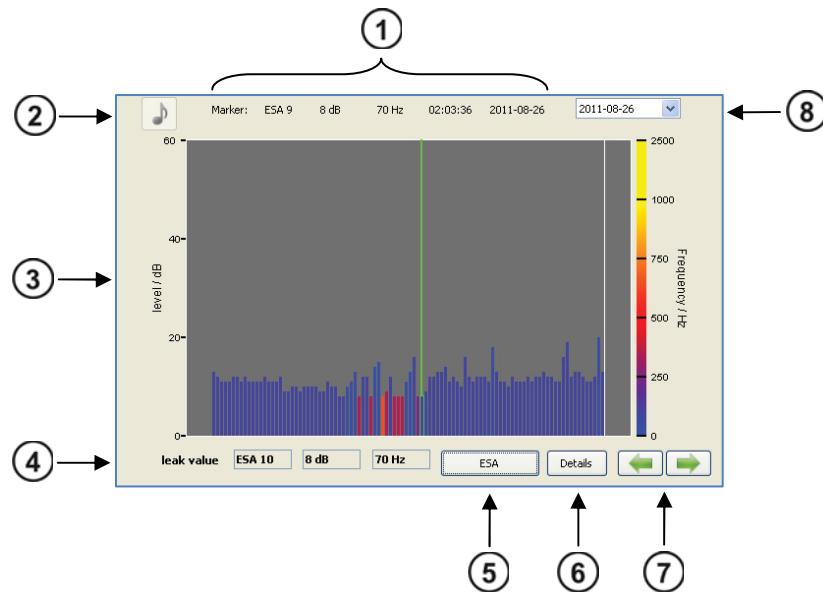
Once downloaded, the measured data from the loggers are saved in the software database and can be displayed (see below in text).

10.6.2 Displaying data in the SDV-3 software

To have the measured data for a network group displayed on the PC, proceed as follows:

Step	Description
1	Mark the logger in the directory tree, whose measured data are to be displayed.
2	Open the tab LogN3 in the multifunction bar.
3	In the segment Measurement data , click on Show data .  Alternatively, you can double-click the required logger in the directory tree to access its measured data.
	 Result: A new window opens. The measured data from the last measuring period are displayed in it as a diagram (see the next page).

The following picture shows the menu for displaying the measured data:



Element	Description
①	Marker (green, vertical line) You can click on each individual bar to have the following values from this individual recording displayed: ESA value / level / frequency / time and date of the measurement
②	Audio data button By clicking on the note symbol button, the 3-second leak noise recording of the measuring period displayed is played back one time. (Strictly speaking, it is the quietest recording of the last measuring day of the period displayed.) However, it is a requirement that the corresponding audio file has already been queried from the logger. If the button is deactivated, there is no audio file stored in the software database for the respective measuring period.
③	Diagram X-axis ... Chronological progress of the measurement Y-axis ... Noise level in dB Each bar represents a single noise recording. The colour of the bar shows the approximate frequency of the noise in Hz.
④	Leak value (minimum value of the display) The ESA value, level and frequency of the quietest recording in the measuring period displayed is shown in the three fields directly under the diagram.

(continued on the next page)

Element	Description
⑤	ESA and/or Level/Frequency button By clicking on the ESA button, the level of the ESA value of the quietest recording (minimum value) in the measuring period is displayed in the diagramme area. By pressing the Level/Frequency button, you can return to the original diagramme display ③.
⑥	Details button This button opens a window in which the most important configuration data for the logger at the time of measurement are shown.
⑦	Scroll buttons   Using the two arrow buttons, you can change to the measured data from the next or preceding logger within the group.
⑧	Historie Using the drop-down list, you can call up measurement data from previous measurements. The date shown refers to the day on which the data have been read out from the logger.

10.6.3 Accessing data from the GSM box using the commander

You can access the measured data for a network group from the GSM box using the commander on site.

Proceed as follows:

Step	Description
1	Take the commander and enter the transmission range of the GSM box for the network. The GSM must be ready for transmission (i.e. it must be within the programmed transmission window).
2	In the main menu of the commander, select the symbol  Result: The ID and the comment for the GSM box concerned are displayed once again. The measured data from the last measuring period are transmitted from the GSM box to the commander. A bar shows the progress of the transmission. Once the data transfer has ended, a new view opens with two lists appearing next to each other. The list at the left shows all loggers from which measured data were received. The list at the right shows all loggers from which no measured data were received. If data was not received from all loggers, this could be due to the following reasons: <ul style="list-style-type: none"> • There was a malfunction during data transmission from the logger to the GSM box which prevented data from the last measuring period from being stored in the GSM box • There was a malfunction in data transmission from the GSM box to the commander To eliminate the second reason, you can repeat the data query using the Read Loggers again button.

(continued on the next page)

Step	Description
3	To have the measured data from a logger displayed, select the required logger in the left window. Result: The menu for displaying the measured data opens. The measured data from the logger are shown in a diagramme (see page 48).